BULLETIN

(*formerly* JOURNAL)

OF THE

AMERICAN GEOGRAPHICAL SOCIETY

OF

NEW YORK

MDCCCCI

Vol. XXXIII

NEW YORK
PUBLISHED BY THE SOCIETY

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BULLETIN

OF THE

AMERICAN GEOGRAPHICAL SOCIETY.

Vol. XXXIII **1901.** **No. 1**

NORSE DISCOVERIES IN AMERICA.

BY

JUUL DIESERUD, A.M.

Discredited at the start, the Norse claim of the discovery of the American continent five centuries before Columbus has gradually gained a respectful hearing from American scholars, and to-day, nine hundred years after the interesting event, stands finally admitted in the opinion of those best qualified to judge the question.

In preparing a commemorative essay on the subject it is therefore, fortunately, not necessary to enter into an elaborate defence of the correctness of the main features of the Icelandic sagas as handed down to us in several well-authenticated manuscripts from the 14th century, corroborated as they are by a number of striking references, dating back to the middle of the 11th, to the testimony of the cautious and entirely disinterested Adam of Bremen.

The question now before the historian and antiquarian is not whether the hardy Norse sailors of the 11th century reached the American continent after having established themselves in its antechamber—Greenland. The question is how far south they proceeded, and whether or not they established a permanent settlement in any of the newly-discovered regions. The first of these points can only be settled in one of two ways. Either there must be discovered unmistakable archæological traces of the Norsemen of that remote period or the geographical hints and descriptions given in the sagas may be followed and a locality fixed upon, chiefly by a process of exclusion.

The former of these methods has repeatedly been employed, its climax having been reached in the well-meaning but exceedingly doubtful conjectures of Prof. E. N. Horsford. All attempts along this line thus far have, however, been fruitless of results, and the verdict of Prof. John Fiske, in his interesting monograph, "The Discovery of America," to the effect that "not a single vestige of

the Northmen's presence here at all worthy of credence has ever been found," can probably safely be subscribed to by friends as well as by enemies of the Norse claim.

It is different with the indications given in the sagas, although nothing like unanimity has as yet been established with regard to the conclusions drawn from them. The chief difficulty rests in the fact that these sagas give two somewhat conflicting versions of the story, one of which must be more genuine than the other. Most writers, like Anderson, De Costa, and Horsford, have failed to acknowledge this, although the last had access to two valuable treatises on the subject, viz.: Prof. G. Storm's "Studies on the Vinland Voyages" and Mr. A. M. Reeves' photographic reproduction of the manuscripts, with a careful English translation.

Of the two versions, the more recent—the one found in the so-called Flatoe-book, a manuscript compiled from older sources about 1387—was at first more generally known, and for a long time accepted as the best authority. It has, however, gradually been losing ground as a consequence of the severe criticism brought to bear upon it by Prof. Storm, and later by Mr. Reeves. According to this version, of which an excellent translation is given in Mr. Reeves' book, the real discoverer of Wineland was one Bjarni Herjulfson, who, about 987, accidentally drifted upon some unknown regions far to the southwest of Iceland, whence he was trying to cross over to Greenland. Some fifteen years later Leif, a son of Erik the Red, the earliest settler in Greenland, went to explore the unknown regions. He struck land to the south in three different places, calling them in succession Helluland (Flat-stone-land), Markland (Forestland), and Vinland (Wineland), the latitude of the latter being approximately determined by the observation that "the sun had both eykt-position and breakfast-position on the shortest day of winter."* The saga then makes Leif's brother Thorvald undertake a separate expedition and explore the country to the west and northeast from the place in Wineland where Leif had had his winter quarters, next gives a curtailed and suspicious account of Thorfin Karlsefni's expedition—to be considered later—and finally makes Erik's natural daughter Freydis go there, accompanied by two brothers, Helgi and Finbogi. On this version Prof. Storm passes a very severe verdict. He points out that no mention whatever has been found elsewhere of Bjarni, whereas it is stated in at least half-a-dozen places that Leif Erikson discovered Wineland on a return trip from Norway. The saga places glaciers in Helluland,

* Sol hafdi thar eyktarstad ok dagmálastad um skamdegi.

makes the grapes of Wineland ripen in winter, and employs a German with the strange name of Tyrker to discover them. Concerning the geography of Wineland the Professor says:

> "It, on the whole, gives one the impression of a coast on the north, extending far to the east and west, and with several firths running in toward the south. One has to indulge in such an arbitrary construction of the sagas as did Prof. Rafn in order to make this description fit the coasts of North America. Weighing all that has been said, it will, I certainly think, be safest to treat the account of the Flatoe-book with the utmost circumspection. Whatever has its only origin there must be rejected, and whatever is found at variance with early traditions regarded as wanting historical foundation. The voyage of Bjarni ought, I think, to be dropped entirely to leave room for that of Leif Erikson."

A far more consistent and probable story is the one given in the Hauks-book, a manuscript of the very beginning of the 14th century—at any rate, not later than 1334—written by the learned Hauk Erlendson, a descendant of the chief explorer, Thorfin Karlsefni. According to this version, Wineland was discovered by the above-mentioned Leif Erikson. He had been on a visit to Norway, had met the famous Olaf Trygvason (who succeeded in converting him to Christianity), and in the summer or fall of the year 1000 was returning to his home in Greenland. He was, however, driven out of his course and came upon an unknown country. There were self-sown wheatfields and vines growing there, and also some trees called "mauser," of which he took some specimens with him. On his arrival in Greenland he reported his accident, and naturally awakened a lively interest in the new regions. Leif set about converting his relatives and neighbors to Christianity; but his brother Thorstein made an unsuccessful attempt to reach the strange country. A few years later one Thorfin Thordarson, called Karlsefni, an Icelander, who had recently arrived in Greenland and married Thorstein's widow, Gudrid, determined to make an effort to explore the unknown lands. Accompanied by Thorvald, another of the sons of Erik the Red, one Bjarni Grimolfson, and Thorhall, called the Huntsman, who was married to Erik's natural daughter Freydis, who went with her husband, he sailed with four vessels and one hundred and fifty followers to the western settlement and Bear Island, and thence bore away to the southward for two "doegr."* They saw land before them,† "and found there large flat stones

* The "doegr" represents a period of twelve hours. A good "doegra sail" seems, according to the best authorities, to have covered something like one hundred and eight miles.

† The quotations are from Mr. Reeves' book, but I have frequently compared his translation with the reproduction of the original manuscripts.

(hellur), many of them twelve ells wide. There were many Arctic foxes there. They gave a name to the country and called it Helluland. Then they sailed with west-northwesterly (or, as one version has it, northerly) winds for two 'doegr' and found a wooded country and many wild beasts. An island lay off the land to the southeast, and there they found a bear, and later called it Bear Island, but the mainland Markland (Forestland). When two more 'doegr' had elapsed they again discovered land and approached it; there was a cape there. The land lay upon the starboard; there were long strands and sandy banks there. They rowed to the land and found upon the cape the keel of a ship, and called it Kjalarnes (Keelness); they also called the strands Furdustrandir (Wonderstrands), because they were so long to sail by. Then the country became indented with bays, and they steered their ships into a bay."

The saga then relates how they lay by there, while two swift Gaels—Haki and Hekja—of their party were dispatched to the south to investigate the nature of the country. They staid away for three days, and returned with self-sown wheat and a bunch of grapes. "They went to their ships and proceeded on their voyage. They sailed into a bay. There was an island out at the mouth of the bay about which there were strong currents, wherefore they called it Straumey (Stream Isle). There were so many birds there that it was scarcely possible to step between the eggs. They sailed through the bay, and called it Straumfjord (Streamfirth), carried their cargoes ashore from the ships, and established themselves there. They had brought with them all kinds of live stock. It was a fine country there; there were mountains thereabouts."

After having related how they ran short of food in the rather severe winter there and captured a whale, the saga tells how Thorhall, dissatisfied with the outlook on the eastern coast, decided to retrace his course and round Kjalarnes in search of Wineland (not to "explore" it, as wrongly translated by many). He reached the cape, but was there met by westerly gales, and finally driven ashore in Ireland, where he lost his life, "according to that which traders have related." Karlsefni, however, cruised southward with Snorri and Bjarni and their people. "They sailed for a long time, and until they came at last to a river which flowed down from the land into a lake and so into the sea. There were great bars at the mouth of the river, so that it could only be entered at high flood-tide. Karlsefni and his men sailed into the mouth of the river and called it there Hop (a small land-locked bay). They found self-sown wheatfields on the land; wherever there were hol-

lows and wherever there was hilly ground there were vines. Every brook was full of fish. They dug pits on the shore where the tide rose highest, and when the tide fell there were halibut in the pits. There were great numbers of wild animals in the woods. They remained there half a month and enjoyed themselves and kept no watch. They had their live stock with them."

Then one morning a great number of men in skin canoes came paddling toward them and went ashore, staring curiously at the strangers. "They were swarthy men and ill-looking, and the hair of their heads was ugly; they had large eyes and broad cheeks." After a little while they rowed away to the southward around the cape. Karlsefni and his men now built huts above the lake and prepared to stay there that winter. "No snow came there and all of their live stock lived by grazing." In the spring the natives again appeared and began to trade with the foreigners, but finally, distrusting their intentions, took to the warpath, killing two of their number. Although Karlsefni succeeded in beating them back with heavy loss, he now determined to leave this dangerous neighborhood and return to Streamfirth, where the party arrived after a couple of unimportant incidents. The narrator here cautiously remarks that some say that Bjarni and Freydis had remained here (all the time) with a hundred men, while only Karlsefni and Snorri had proceeded to the southward with forty men, tarrying at Hop barely two months and returning again the same summer.

"Karlsefni then set out with one ship in search of Thorhall the Huntsman, but the greater part of the company remained behind. They sailed to the northward around Keelness, and then* bore to the westward, having land to the larboard. The country there was a wooded wilderness as far as they could see, with scarcely an open space, and when they had journeyed a considerable distance a river flowed down from the east toward the west. They sailed into the mouth of the river and lay to by the southern bank." After having told how one morning they discovered what seemed to be a uniped, and that Thorvald, another son of Erik the Red, was shot by him, the saga goes on to tell how they sailed away back toward *the north* [the direction is plainly stated], and believed they had got sight of the unipeds. They concluded that the mountains of Hop and those which they had now found were the same, "and this appeared to be so, because they were about an equal

* "Ok berr thá fyrir vestan fram" can also be translated; "and then proceeded [southward] on the western coast," this being clearly the opinion of the author, as shown later.

distance removed from Streamfirth both ways." They sailed back and passed the third winter at Streamfirth. In the spring, however, they decided to return to Greenland. "When they sailed across from Wineland they had a southerly wind, and so came upon Markland, where they found five skrellings—one man, two women and two children. They captured the boys, but the others escaped and 'sank into the earth.'" These boys they took with them arrived safely in Greenland (there is no mention here of Helluland), and remained during the winter with Erik the Red.

The above is, in the words of Prof. Fiske, "a sober, straightforward and eminently probable story." He points out how it would hardly occur to European fancy to invent such a thing as self-sown wheat. He is, however, undoubtedly wrong in thinking it was Indian corn, because a plant so strikingly unlike anything with which these Icelanders were familiar would surely have been described by them in other terms.* He calls attention to the fact that savages were practically unknown to Europeans before the 15th century, that they knew nothing whatever about peoples who would show surprise at the sight of an iron tool, or terror at the voice of a bull, or who would eagerly trade off valuable property for worthless trinkets—incidents which, for want of space, could not be quoted in the preceding summary. He thinks that the description of the skrellings (inferior people), with their "swarthy hue, ferocious aspect, ugly hair, big eyes and broad cheeks," will do very well for Indians, the "big eyes" probably referring to the eye-sockets, as suggested by Prof. Storm. The expression skin-boats, of course, rather points to the kayaks of the Eskimo than to the Indian canoe. This inaçcuracy can, however, be accounted for on the ground that the explorers failed to examine the material of the boats, and simply inferred that, as a matter of course, they must be made of skin, since they were not wooden keel-boats. They may, furthermore, have had an opportunity of examining a boat in Markland, where the inhabitants met with, living in caves, probably were Eskimos. In the "flat stone," Prof. Fiske, with good reason, recognizes the familiar tomahawk, and in the big ball, raised upon the end of a pole, the "demon's head"—according to Mr. Schoolcraft, commonly used among the Algonquins in exactly

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* The first to point out that the self-sown wheat of the sagas in all probability was wild rice (Zizania aquatica) was, I believe, Prof. Schubeler, of the University of Christiania. His theory has been accepted by Prof. Storm and Mr. Reeves. In Vol. 9 of the American Anthropologist, Mr. G. C. Stickney has an interesting article on the Indian use of wild rice, the "folles avoines" of early French explorers.

the manner described in the saga. He concludes by saying: "Throughout the account it seems to me perfectly clear that we are dealing with Indians."

Before attempting to reach some opinion with regard to the locality of Wineland, it will now be necessary to devote a little additional attention to the relative merits of the two sagas. Personally I believe, with Prof. Storm, that the older Hauks-book, a manuscript written by a descendant of Karlsefni, Hauk Erlendson, tells by far the best-authenticated and consistent story. It is a narrative that was preserved, we may be sure, with great faithfulness and care in the family of Thorfin, the true explorer of the country, among whose descendants were counted three bishops and many other prominent men. It was inherited from father to son for some three generations and probably reduced to writing in the first part of the 12th century, getting its present shape some 150 years later at the hands of the learned Hauk. Being a family history, it is, of course, possible that these descendants, including the last editor, consciously or unconsciously dragged into the story of Thorfin's expedition incidents that did not belong there, and more especially laid hold of the expeditions of Thorvald and Freydis in order to make their ancestor the first and only explorer of the country. The saga, however, does not show any tendency to magnify the personal qualities of Thorfin; he nowhere plays the role of a mythical hero or plumed knight, but the story is in the main plain and probable.

Turning to the version of the Flatoe-book, it presents, as pointed out by Prof. Storm and Mr. Reeves, a great number of weak points. It is evidently founded on narratives preserved in the family of Erik the Red—a somewhat problematical character—and the bragging tone and many fanciful incidents related stand in a marked contrast to the sober tale of Hauk. The final compiler or some predecessor did not, it seems, like the inconspicuous role played by Leif and his family in the exploration of the country, or perhaps had somehow really got the mistaken idea that Leif went to Wineland from Greenland. He, therefore, borrowed incidents and descriptions from the story of Thorfin, constructed Tyrker in analogy with Haki and Hekja, and made Leif erect his booths near a lake from which a river went out into the sea. It then became necessary to make somebody else discover the country explored by Leif. The saga of Thorfin mentioned one Bjarni Grimolfson; and another man, Herjulf, probably was among Erik's early followers. This may have given the clue to the story of Bjarni Herjulfson, mentioned absolutely nowhere else. Thinking that Leif's brother, Thorhall,

played too small a part in the story, by only accompanying Thorfin, he next made him undertake a separate expedition and supply the keel for Kjalarnes. It then became necessary to reduce Thorfin's followers from 150 to 60 and to curtail his story in various ways. Finally, an incident related of the stalwart Freydis and the short mention of some quarrels caused by the women during the last winter in Straumfjord sets somebody's imagination working till we get a gruesome tale of her separate expedition to Wineland in company with the brothers Helgi and Finbogi. This may seem to be a hazardous conjecture, but it is substantially the view adopted by Prof. Storm and Mr. Reeves, and the only way out of it is to regard the saga of Thorfin as the result of a similar process.

But even the saga of Thorfin cannot evidently be treated as a modern description of travel. No extensive report of the expedition could have been committed to writing before the beginning of the 12th century.*

Ari Frodi, the Father of Icelandic historiography, lived then, and in his abridged Islendinga-book makes a short but significant reference to Wineland and the Skrellings, claiming the authority of his uncle, Thorkel Gellison, who in his turn said he had it from a follower of Erik the Red. A larger "Book of the Icelanders," by Ari, is known to have existed, and may have given a somewhat extended account of the discovery; but even this is conjecture.

Bearing this clearly in mind, we are bound to admit that certain details were in the nature of things more liable to be corrupted than others during those more than a hundred years of oral tradition; though the memory of those early Norse saga-narrators surely was wonderful. Among such details, naturally, are the number of "doegr" consumed in sailing between the different regions visited. This number is in Hauks-book uniformly placed at two, which is in itself suspicious. Mr. Reeves points out the similarity between p(-thvau, two) vau and siau (seven), and suggests that the latter had been given in an earlier manuscript in the first of the places where two occurs. Prof. Storm calls attention to the fact that the saga-narrator evidently placed Kjalarnes in the latitude of Ireland, where we find it on the map of Stephanius (1570). And as it took six "doegr" to sail from Iceland to Ireland, he probably wrongly concluded that the voyage from Bjarney to Kjalarnes was accomplished in the same length of time. It is also significant in this connection that the Flatoe-book gives two, three and four "doegr" for the different dis-

* There are very insufficient grounds indeed for the statement of Fiske that it may have been committed to writing already in the middle of the 11th century.

tances traversed by Bjarni Herjulfson. Somewhat less liable to be misrepresented would be the shape of the country and the approximate direction of the winds used in reaching it, while the nature of the climate, the products of the country, and the descriptions of the peoples met with would naturally cling more tenaciously to the memory, although unusual traits were apt to be somewhat exaggerated. The self-sown grain and the vine, mentioned by Adam of Bremen, the vine being furthermore incorporated in the name of the New Country, as referred to by Ari Frodi, must be the main pivot on which our research turns, and would alone seem sufficient to refute any theory placing Wineland somewhere on the Labrador coast or in Newfoundland, not to speak of the impossible theory of Mr. J. P. McLean and others, who even suggest the Northwestern regions of Greenland.

Another observation that would easily cling to the memory is the one referring to the length of day in Wineland, and although not recorded in the earliest manuscript, it certainly makes a genuine impression. This is not the place to enter into an elaborate discussion of the true significance of the term "eyktarstadr." I can only say that I subscribe entirely to Mr. Reeves' opinion that the question has been finally solved by Prof. Storm. I am familiar with the use of the word "eykt" (mod. Ökt.) in three widely-separated regions of Norway. It signifies everywhere at the present date the interval of time between the meals (an addition, from auka, to add), and in some places, as also evidently in Iceland in those early days, developed the secondary meaning of the end of the particular eykt, terminating in most places at four o'clock, in some localities as early as 3 or 3.30, but very rarely as late as 4.30. The second part of the compound, however, points to a kind of sun-dial and octant, well known among the ancient Norwegians, and to the position of the sun in the horizon. "Eykt" in this sense is clearly defined in a paragraph in the ancient law-code "Gårgås," and the expression used in the account of Leif would place the latitude recorded not farther north than 49°–50′. For it merely stated that the sun "had" or reached this point of the octant, whereby it is not denied that it may have passed somewhat farther. Prof. Horsford's explanation of this sentence is on a par with the rest of his exceedingly unscientific treatment of the subject.

The description of Wineland as given in the Flatoe-book version did not give us any clue to its location. Let us now try with the one in Hauks-book. A prominent ness (Keelness) jutting out towards the north; a long sandy beach, a firth, one of the many, with an

island outside of it and marked tides running in and out (Straumfjord); a considerable distance farther south a river flowing out of a lake in a rather mountainous country (Hop); and retracing our steps to the southwest of Keelness, about as far from Straumfjord as was Hop on the eastern side, a river flowing from the east toward the west from mountains which were judged to be identical with those in Hop on that very account. Where on the American coast can anything like it be found? It is only too plain that the region around Boston does not fit the description at all. In order to make it at all probable that the Boston region was meant Prof. Horsford had to chop up the saga of Thorfin* in a most uncalled-for and pitiless manner; and the worst of the matter is that he could not even then make his case good. While it is evident from the context of the saga that Thorfin, on his return from Hop, when searching for Thorhal, sailed to the southwest after having rounded Kjalarnes, proceeding till he came to a river that flowed from the east toward the west, at the mouth of which he lay by, Prof. Horsford succeeds in making himself believe that this applies wonderfully well to the Charles River, which flows in that direction for a little distance between Cambridge cemetery and Warren bridge (p. 79). This is assuredly giving us stones for bread. The same wonderful brand of logic makes Thorvald (p. 68) explore the same river, when it is stated in the saga that "they proceeded along the western coast" from Leif's booths. It is only eclipsed by the ease with which he makes him return to Gurnet from Cape Cod (his Keelness), when the saga expressly states that "they sailed away thence to the eastward."

The case stands somewhat better with those that follow the suggestion of Prof. Rafn, and place Wineland, and more especially Hop, somewhere in Rhode Island. Cape Cod being the only place in New England that to some extent answers the requirements of Kjalarnes, Hop must, as a matter of course, lie farther to the south; and as far as this goes any river on the New England coast flowing out from a lake near by would help us out. If we only had to consider the location, Monomy (Horsford) would do fairly well for Straumey, and for several reasons better than one of the islands outside of Buzzard's Bay (Rafn and others). There is, however, not the slightest indication that the explorers sailed straight west from Straumey, the saga on the contrary using the terms "southward" and on returning "northward." And how explain the fact that

* In "The Landfall of Leif Erikson." It is difficult to believe that this vandalism can have been committed in good faith.

Thorfin, after rounding Keelness, proceeded westward and southward till he came to a river that flowed from the east towards the west? There is no such river on the Cape Cod peninsula. Again, what of the mountains which they found there and judged to be identical with those in Hop, because they had now proceeded about as far on the western side of an island or peninsula as they previously had on the eastern?

Mr. L. G. Power, in Vol. 8 of the New England Magazine, sticking tenaciously to the small number of "doegr" consumed in sailing from Bjarney, which he wrongly identifies with Disco, to the Kjalarnes of Wineland, tries to show that the latter point may be identical with Cape Chudley, the George River emptying into the Ungava Bay being the river mentioned, flowing from the east towards the west. This would look quite plausible as far as the shape of the coast is concerned, although the correct interpretation of the language of the saga, as given in the best manuscript, requires the same mountains for both regions east and west and not merely widely different parts of the same chain. And what of the vine, the self-sown grain, and the mild winters, not to speak of the statement regarding the more southern latitude? The whole theory breaks down at the slightest touch of criticism. It can easily be proved that this Bjarney could not have been Disco, any more than one of the islands on the Cumberland coast, suggested by Mr. J. T. Smith.

In the *Proceedings*, Royal Society of Canada, 1898, Bishop M. F. Howley advocates a new theory, placing Helluland near Point Riche, Newfoundland, where are found some remarkable flat stones, Markland in one of the Magdalen islands, and Wineland around Miramichi Bay. This is again a case of sacrificing the whole for the part. It is completely at variance with the text of the sagas to look for Helluland at the western coast of an island. Markland is, according to the best version, situated to the southeast. And, finally, the description of Kjalarnes, Wonderstrands, Straumey, and the distant Hop far to the south is entirely misleading if we select the coast of New Brunswick.

But there is such a peninsula as the one described in the saga on the eastern coast of North America. Supposing that Thorfin and his men sailed from an island near Fiskerfjord, in the Western Settlement, as thinks Prof. Storm, they would then most probably first strike some part of Labrador. Finding it extremely uninviting, they again made for the open sea, with a west-northwesterly wind, and next struck either the northeastern coast of Labrador,

opposite Newfoundland—which latter, or more probably Belle Isle, then would be the island mentioned—or some part of Newfoundland farther east. They then proceeded along the coast of Labrador, and finally set straight south, or along the coast of Newfoundland, rounding Cape Race and steering west-southwest, keeping the southern shore in sight for a long time.* In either case they could very easily strike Capes North, Egmont, or Breton. Prof. Storm suggests Cape Breton; but if we stick to the description of the sagas, I venture to think that Cape North or Cape Egmont meets the requirements of the case better, although less easily stumbled over from Newfoundland. If we select Cape North, Wonderstrands would be the long, comparatively unindented, partly sandy coast-line between that cape and St. Ann's Bay. The Firth, into which they stood, need not have been the very first met with. It might have been Mira Bay, outside of which is Scatari Island, that to all appearances could do very well for Straumey. Not finding the climate or natural conditions of the country up to their expectations, it is now conceivable that Thorhal wished to sail northward again and look for Wineland, on the western shore, of which they had evidently caught a glimpse in approaching Capes North and Egmont.

Karlsefni, however, proceeded southward for a long time, finally lying by at the mouth of a river that flowed out of a lake and could not be entered with their craft, drawing some seven feet of water, except at flood-tide. There are many small rivers in Nova Scotia between the Gut of Canso, which the explorers naturally regarded as a firth, and the southern extremity of the peninsula, that will meet the requirements; but if I am correct in placing Streamfirth as far north as Mira Bay, Hop (the true Wineland) could not very well have been farther south than Halifax.

Retracing his course, Karlsefni and his men then rounded Cape North in search of Thorhall, proceeding along the western shore for a considerable distance, finally stopping at one of the rivers flowing there from the east towards the west, coming from mountains which they judged to be identical with those seen in Hop. If they were approximately correct in this surmise, they must have passed the St. George's Bay, and stopped at one of the small rivers flowing out in the Northumberland Strait, east of Merigomish Harbour, the divide of Guysborough and Halifax being the mountains mentioned. Directly opposite Merigomish Harbour is St. Mary's Bay; but being much nearer to Mira Bay (Streamfirth), we are no

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* The exact direction of the wind is not mentioned in this case.

doubt justified in placing Hop farther south. On leaving the country for good they again struck Labrador or Newfoundland, and then seem to have set sail directly for the Eastern Settlement.

Turning now to the other features of Nova Scotia, its latitude is sufficiently different from that of Greenland to arrest the attention of the explorers. There is little difficulty about the wild rice and vine, especially the latter, which was found there in abundance some five hundred years later by Jacques Cartier and others, and still is here and there met with, if not in a sufficient quantity, to justify the statements of the Hauks-book. It is true that the winter in Hop is described as snowless. But taken literally, this would point to a more southern latitude than anybody has yet ventured to claim for Wineland, and we may be well justified in regarding this as a slight exaggeration, reasonably accounted for by their comparing the climate with that of Greenland and Iceland.

The only weak point in the theory of Prof. Storm, and less so in the one here advocated by myself, is, in my opinion, the rather unfrequent occurrence of sandy shores between Cape North and the Gut of Canso. As a matter of fact, however, there is in the Ingonish Bay, which is wide and open, a sandy beach of considerable length—at least one mile. For this I have the very best authority—viz., a letter from the Director of the Geological Survey of Canada—and this would, according to my view, be the identical place where the explorers lay by while waiting for the return of the Scotch messengers—an incident that has given the advocates of the barren Cape Cod peninsula any amount of trouble. It is, therefore, extremely probable that the explorers expressly mentioned this sandy beach when relating their story in Greenland and Iceland, and the first historian that committed the account to writing was not far off the mark when he wrote that "there were long shores and stretches of sandy beach there."

We must, furthermore, remember that the name given to this shore is our most reliable clue to its whereabouts, and that "Furdustrandir" has nothing whatever to do with sand. It is true that "furtha" in Icelandic meant "a wonder," but as a qualifying term "furthu" generally must be rendered by "wonderfully big or extensive," and the most correct translation of the name in question is the "wonderfully extensive strands." That this is the true explanation is also evident from the statement of the saga itself, that these shores received that name "because they were so long to sail by." And in this respect the 60 miles long, almost entirely

unindented, coast-line from Cape North to St. Mary's Bay can well stand comparison with the much shorter Cape Cod peninsula.

And then we have another piece of evidence that more than counterbalances the sandy shores of Cape Cod. According to De Costa, wild grapes are even to-day growing there among the shrubs, within the very reach of the ocean spray. But if that is the case, why did Thorfin dispatch two messengers to the south to search for an article which must have been there in abundance, right under his eyes? And why did they not even discover any grapes in Straumey, as plainly shown in the saga, if this was identical with Monomy or Martha's Vineyard? This extremely important fact has, singularly enough, been overlooked by everybody; and yet it is worth more than all the bushels of sand that have blinded the eyes of Prof. Horsford and other uncritical defenders of an untenable theory. It is self-evident that Thorhal the Huntsman need not have despaired of finding Wineland on the eastern coast if he had already reached Martha's Vineyard. But we may forgive him if he spoke contemptuously of the lack of wine and the other unpromising features of Scatari Island.

As regards Markland, it seems clear to me that there is no serious objection to placing it in the southern part of Labrador. We must remember in this connection that the explorers came from almost entirely treeless regions, and were apt to be satisfied and even surprised at the first sight of a comparatively insignificant patch of real forest land. And, as a matter of fact, the Labrador coast is by no means everywhere the barren, sterile affair that most people imagine.

In the third edition of the Newfoundland and Labrador *Pilot*, 1897, we read that St. Lewis Inlet, situated only a short distance north of Belle Isle—the very region where, in my opinion, the explorers may have landed the second time—can boast of a fine forest vegetation at the very mouth of the bay. An island inside, even, has the significant name Wood Island, and in the bottom of the inlet the trees are large enough to be used by the Newfoundlanders for their schooners and boats. This region, then, decidedly deserved to be christened Markland. As for the sand, our troublesome friend from Wineland, there is no such thing attributed to Markland in the best manuscript. And, if it should come to a pinch, the explorers need only have followed the coast to Pinware Bay, where, according to the *Pilot*, a fine sandy beach would have greeted their eyes. That something like this was the case seems more than probable, when we remember that nothing in the saga speaks

against it, and that their errand was to explore countries that had already been, to some extent, located.

With regard to Helluland only a few remarks need be added. Every person familiar with Old Norse, as well as modern Norwegian and Icelandic, will know that the name must refer to loose, flat stones, as stated in the Hauks-book, and not to a single flat rock, as wrongly given in the Flatoe-book. And he will only pity Prof. Horsford, who naively reproduces a picture from the east coast of Newfoundland, in which the ruffled rocks depicted have no more resemblance with "hellur" than with the man in the moon. But pity will be mingled with astonishment when he reads that the icebergs floating in the distance are the inland glaciers described in the last-named saga as forming the border of the rock. Surely this kind of historical research needs a strong money-backing to get into print. That some real good-sized "hellur" are to be found somewhere on the vast Labrador coast must, with our present knowledge of the country, seem altogether too probable. Both the Arctic foxes of the only reliable saga and the glaciers of the Flatoe-book decidedly point to a high latitude, not to speak of the fact that the region presumably was entirely treeless.

I must, therefore, maintain that the Nova Scotia theory, on the whole, offers by far the fewest difficulties, and I am unable to see any good reason why we should rather select Cape Cod. The only justification for doing so must certainly be positive archæological evidence. This has, as already mentioned, failed to appear, in spite of the praiseworthy efforts of those who have so earnestly sought it. If I am not mistaken, very few competent archæologists or historians take Prof. Horsford's extremely uncritical philological deductions or his Norse ruins seriously. His etymological speculations on Norumbega, Cape Carenas, and America are more than sufficient to put any person possessing a philological training on his guard. The first mentioned of these names, employed on some of the earliest maps to designate a region south of the St. Lawrence, may with the utmost confidence be said to have as little to do with Norway (mod. Norwegian "Norge" about year 1,000, and later "Noregr.") as with Watertown on the Charles.

I am, however, inclined to think that Mr. Weise was equally wrong in connecting it with the Palisades of the Hudson, explaining the word as a corruption of "Anormée Berge," the "great scarp." Space forbids my taking up this difficult subject here; but in my opinion the earliest form of the word "Noranbega" stands for Normanbega, the latter part of the compound being, as already

suggested by De Costa, the Spanish "vega," meaning a "plain at the mouth of a river." The name seems, as every historian knows, to date from Verrazano, whose expedition started from Normandy, in France. It is first found in a map ascribed to his brother, and there evidently corresponds to the "Normanvilla," given on the five years' older Majollo map, also founded on Verrazano's expedition. My explanation is that the said brother, knowing that no town had been found on the entire coast, changed "villa" to "vega"—a term then current on Spanish maps. The first letters of the word as given by him are in fact illegible, and the "*r*" in . . . ranbega, commonly read out of it, may be part of an "m." Later this letter was dropped for reasons that need not here be stated, and the other forms, like "Nuremberg" and "Norvega," are easily explained as the product of ignorance and a false interpretation. The theory propounded by Beauvois and others, placing a permanent Norse settlement somewhere in Nova Scotia or New Brunswick, not to speak of New England, is only supported by the slenderest thread of evidence, while the entire Old-Icelandic literature, as a matter of fact, goes directly against it. And even if such a settlement was effectuated, the chances are a hundred to one that it would not have received the name of "Noreg" or "Nordanviga."

Still more fanciful is the derivation of Cape Carenas, which probably did not even designate Cape Cod on an early map. It tries the patience of a philologist sorely to find Carenas on Lok's map through Coaranes or Merriam's traced back to Kjolrnes, Kjalarnes, "probably learned from natives, the offspring of mixed parentage" (p. 12). We have, of course, to do with the Italian or Spanish *Carenas* (Lat. *Carinæ*, French *Carènes*), which means Keels, and evidently refers to the shape of the cape.

This does not refute the theory that the Norsemen struck the identical cape and gave it the name of Kjalarnes for the same reason. But it is certainly enough to prove that no connection was at all necessary between those two events.

Of the derivation of America from Erik the Red through the intermediate forms of Ereka, Emereka, Mr. McLean pointedly says: "This method of treating philology is enough to cause the bones of Sir William Jones to turn in their grave."

The few specimens of the testimony to be derived from names of places as introduced by Prof. Horsford will probably suffice for most readers. After considering them, one does not feel surprised at all in noticing the ease with which he pointed out a Norwegian

fish-pit here and a building site there, not to speak of shoals, islands, capes, and landing-places. But we cannot help feeling that the corroborative evidence of an eye-witness less apt to be carried away by his enthusiasm would be very desirable. I understand that Miss Cornelia Horsford is still working on the same lines, and hope that after all some valuable piece of evidence may be forthcoming.* It is now the only means by which thoughtful students of the sagas can be brought to change their conviction that the Norse explorers most probably never passed the southern extremity of Nova Scotia.

As pointed out by many, the chances are, however, very small that anything will be found, for the simple reason that the Norsemen, as already mentioned, evidently failed to effect a settlement of the country. The sagas do not contain a single statement from which to draw the opposite conclusion, and Prof. Fiske justly lays stress on the fact that no descendants of European domestic animals were ever met with in North America 500 years later. The only structures erected by the explorers, probably, were the dwellings of Thorfin, possibly wooden frame houses (budir, booths) resting on corner-stones or wooden blocks, for which it would be vain to look at this late date. The fish-pits dug in the sand would not, under favorable circumstances, last for fifty years, and the palisades would rot down long before the advent of the 19th century. An axe or sword-blade might be found, it is true; but until some such relic is produced we shall be justified in expecting it to turn up in Nova Scotia rather than in New England, however fervently our patriotism may desire the latter alternative.

Space forbids my consideration of the historic importance of this early discovery of the New World and its relation to that of Columbus. Even most Norwegians have of late little patience with the childish exaggerations of Miss Mary Brown, now Mrs. Shipley, and the efforts to belittle the deed of the Genoese explorer; and they look upon the feat of the Norsemen as one of those interesting premature exertions of which history records so many. The Leif Erikson Monument Society of Chicago, which has been striving hard to erect a monument for Leif in 1900, did not succeed in raising the necessary funds in time. The excellent Norwegian sculptor, Mr. Sigvald Asbjornsen, is, however, at present hard at work with

* Her article in the December number, 1899, of the Popular Science Monthly, did not, so far as I can see, add anything of interest to the solution of the question. She most uncritically accepts her father's view of the sagas, and the sober statements of Mr. Erlingsson and Dr. Gudmundsson, appended to her article, seem completely to dispose of the alleged Norse ruins discovered.

the elaboration of a splendid model which has received the unanimous approval of an art committee. The statue is to be unveiled next spring. It is sure to be a fitting celebration of the final admittance into the text-books of this country of a much-abused historical fact.

THE SIEGE IN PEKING: ITS CAUSES AND CONSEQUENCES.

AN ADDRESS BY

DR. W. A. P. MARTIN.

MR. PRESIDENT AND GENTLEMEN OF THE GEOGRAPHICAL SOCIETY:

You have asked me to give you some account of the siege in Peking, together with the causes that led up to it, and its probable outcome. No proper view of the thrilling events which have there taken place can be given without first touching upon the *geographical situation.* Man is moulded by his environment, and it would not be difficult to show how the character of the Chinese—physical, moral, and intellectual—has been formed by the geography of their country. Of England a well-known poet, after satirizing the villainous climate of his country, exclaims:

> "Tis thus, with rigor for his good designed,
> She rears her favorite man of all mankind."

A Chinese philosopher would unquestionably adopt without objection every word of the English poet, and he would lay special emphasis on the phrase, "Her favorite man of all mankind." He reads in the ancient books of his own country a tradition that man was made, not of dust but clay, the clay being of different colors. The Chinese were made first, and of yellow clay, hence they gave themselves the flattering designation of "Men of Gold." That title we find to have been a common one amongst the Tartars of the north. In the eleventh and twelfth centuries a large part of northern China was subject to a body of Tartars, who bore the tribal name of "Golden Horde." The present rulers of China, called Manchus, claim them for their remote ancestors, and continue to wear the same title of "Golden Horde"—in the Manchu language "*Aischin Gioro.*" Having referred to the Tartars, I would like to have you observe that their relations to the Chinese from time immemorial have been very similar to those of the Shepherd Kings to the rich inhabitants of the Nile Valley. The Chinese depended upon agriculture, while the wandering nomads of the northern plains subsisted on their flocks and herds without settled homes. They were always ready to make incursions into the bordering provinces of China, and oftentimes succeeded in effecting the conquest of a portion, or the whole, of the Chinese Empire. It is

startling to discover that one or other of these northern tribes, Mongol or Manchu, has exercised the mastery over China for seven hundred out of the last fifteen hundred years; nor are the troubles caused by them limited to seven centuries, for the Great Wall, so huge as to form a geographical feature on the surface of the globe, attests a perennial conflict between Tartar and Chinese, for it was erected two hundred and forty years before the Christian era for the express purpose of keeping the Tartars out. That such a conflict should exist from generation to generation is no matter of surprise. Schiller tells us that it began not far from the Garden of Eden, and has been handed down from Cain and Abel to the present time. His version of the Bible story is that Abel's sheep trespassed on the cornfields of his brother Cain.

A Chinese historian says of the Great Wall: "It required so much labor for its construction that it was the ruin of one generation, but it was the salvation of all that followed." To me this appears to be an over-estimate of its benefits; for while it has undoubtedly served the purpose of a barrier against small bodies of marauders, it has never sufficed to restrain great armies like those of Genghis Khan. The Manchus, who for two hundred and fifty-six years have held the throne in Peking, were not under the necessity of forcing their way across this international barrier, but had its gates thrown wide open for them by a Chinese General, Wu San Kwei. He invited their assistance to suppress a body of rebels who had got possession of the Capital, and to take revenge for the crimes committed by them—an errand very similar to that of the eight Powers now in occupation of China. The rebels were easily put to flight, but when the General offered to pay off his Tartar allies and invited them to retire to the north of the Great Wall they respectfully declined to do so. An old fable tells us that an ass, in danger of being driven from his pasture grounds by a horned stag, invited a primitive man to mount on his back and drive away his enemy. When the stag was put to flight, he asked the man to dismount; but he was an ass to imagine that the man would comply with his wishes. China finds herself in the same predicament to-day. Instead of the Manchu Tartars, ranged curiously enough under eight banners, she finds herself completely under the power of the eight mightiest nations of the globe. They are in the saddle, with their bit in the ass's mouth, and though that noble beast, like that of the ancient prophet, speaks with human voice, and utters an energetic protest, it remains to be seen whether some of these eight nations will not persist in keeping their place in the saddle.

The fact that China is, and has been, under foreign domination for two centuries and a half is essential to the comprehension of that astounding movement which has so engrossed the attention of the world. The cooping up of eleven Legations in the capital of China, together with a war of extermination on all foreigners, and foreign interests of every description, whether mercantile or missionary, calls for explanation. What motives, we are asked, could prove themselves so potent in their effect on all classes in that Empire as to bring about combined action of high and low for the expulsion of foreigners? I answer that there are three motives which, taken in connection with the circumstances of the age, appear to me to be sufficient to account for the phenomenon. They are, first, political jealousy; second, religious antipathy, and last, but not least, industrial competition. These have operated in different proportions on different classes, while in some instances all three have combined to produce their effect on the mind of one class. The existence of political jealousy is inseparable from a foreign domination.

The Manchu dynasty, though it has produced many able rulers, has never been free from the influence of that kind of jealousy. The Manchus have always feared, since the dawn of commercial intercourse with the great nations of the West, that some of those nations would endeavor to supplant them in the occupation of China. They have accordingly been suspicious of everything, whether commerce, missionary enterprise, or railways and mines, which tended to increase the prestige of foreigners. Some of these undertakings they have looked upon as a pre-emption claim on their territory; others as a settled scheme for winning away the hearts of their people. You will naturally infer that they have never shown themselves, with one exception, which I shall presently mention, very solicitous for the intellectual enlightenment of their Chinese subjects. The old philosopher, Laotse, lays down as a maxim for easy government—in satire, no doubt—that it is only necessary to fill the people's bellies and to empty their skulls. On this the present rulers of China—I mean the Empress Dowager and her clique—are acting in the suppression of schools, the interdiction of newspapers, and the attempted extirpation of Christian Missions. The exception referred to is a remarkable one. It is the young Emperor, Kwang Su, who is in no degree responsible for hostilities with foreign Powers, but is rather to be regarded as the first victim on a long and sanguinary list. Nephew of the Empress Dowager, he was adopted by her at the age of three. With a view

to preparing him for his great destiny, he was provided with numerous instructors, two of whom were my own students. Their duty was to induct His Majesty into a knowledge of the English language, and in order to be sure that the lessons which they set for him were correct, they always submitted them to me for approval. I shall not affirm, therefore, that I am entirely innocent of having exerted some influence to bias the mind of the young Emperor.

It is impossible that he should have studied English without becoming infected with progressive ideas. Still, the blame, or the honor, of having perverted the mind of the "illustrious successor" (as his name signifies) belongs to Kang Yu Wei more than to any one else. This patriotic scholar perceived the necessity of reforming the educational system of China in order to secure the permanent independence of his country. He got the ear of the Emperor, and of that young man it is no little praise to say that he possessed the intellectual capacity to comprehend the ideas of the bold reformer and the strength of will to resolve on carrying them into effect. He issued decree after decree, with startling rapidity, setting aside the effete system of essays and sonnets in civil service examinations in favor of the sciences and practical arts of the modern world. In order to prepare students for these new tests, a system of common schools was to be established, Taoist, Buddhist, and Confucian temples being placed at their disposal. Middle schools were to be established in all the districts, and colleges in the several provinces, with a new University in the capital for the graduates of provincial institutions and for the sons of the nobility. Nor did His Majesty stop with educational reform. He diligently sought to prune away the dead branches of the tree in order to increase the quantity and improve the quality of its fruit. Sinecures in the Mandarinate were abolished, and new bureaux established, such as those for commerce, mining, and agriculture. More than all, he resolved to confer on his people the priceless boon of free speech, ordaining that even junior officials should have the privilege of addressing the Throne without let or hindrance. This was the rock on which his noble scheme of reform was shattered. A young man, a doctor in the Han Lin, who was well known to me, though a junior member in the Board of Rites, drew up a memorial proposing numerous changes in the administration of the Government. His chiefs, all old men, and mostly Tartars, refused to transmit the document to the Throne. The Emperor, on learning that they had dared to intervene between him and his officials, flew into a towering rage, stripped them of their official honors, and threatened to dismiss

them from the public service. Those old men, smarting under the disgrace, posted away to the Country Palace, and threw themselves at the feet of the Empress Dowager, begging her to come out of her retirement and save the Empire from the hands of a young man who was driving the chariot of State so furiously that there was danger of his setting the world on fire. She had been Regent twice before, but she had never retired altogether from the world of politics. With her neither card parties, nor novels, nor theatrical shows, could compete in interest with the political chess-board; in all moves on that board her fingers had been more or less concerned. Eagerly did she embrace the invitation, and as with a bolt out of the blue she struck down the impetuous youth, compelling him to sign a paper begging her to teach him how to govern. By way of justifying her action, she issued an edict, in which, amongst other things, she said that her subjects must not suppose that she was opposed to rational progress. It does not follow, she said, that we should stop eating because we have been choked. She meant to say that her adopted son had crammed his reforms down the throats of his people too fast for their digestion. She intended to administer them with judicious moderation, in such quantity and degree as would make them easier of assimilation. Well had it been for her and her dynasty had she adhered to this principle; on the contrary, throwing herself into the hands of a reactionary party, instead of progress she entered upon an anti-foreign reaction, in which a disastrous smash-up became inevitable. She began by cancelling all the educational and other administrative reforms inaugurated by the young Emperor.

The only one of the institutions established by him which she permitted to remain was the new University. That institution she no doubt spared because it had been favored or, as one might say, founded by Li Hung Chang, who, by the way, though he still continues to be her faithful servant, has behind him a record of imperishable glory as the foremost patron of the new education in the Chinese Empire. It was he who recommended me for the Presidency of the University, which I may describe as at present in a state of suspended animation, the Russians having seized on the buildings for soldiers' barracks and threatened to confiscate its funds, which were deposited in Russian banks.

A little before the *coup d'état* Germany had seized a seaport by way of reprisal for the murder of two of her missionaries in the south of Shantung. Russia demanded the cession of Port Arthur as an offset. England insisted on having Wei Hai Wei, on the

opposite side of the Gulf, in order to keep watch on the movements of her northern rival. France, in the far south, protested against being left out in the cold, for was she not as great a Power as any of them? She demanded that the equilibrium of the political balance should be maintained by giving her the Bay of Kwang Chau, not far from the borders of her Anamite Empire. The Empress, who by this time had become Regent for the third time, was irritated beyond endurance, and while she feigned to yield to these demands rather than to make war without due preparation, she made it known to her people that if any other nation should come forward with similar demands she would declare war. In the meantime she made extensive purchases of war material, and sought by every means to propagate anti-foreign feeling among her people, as the best safeguard against foreign aggression.

Never had the anti-foreign feeling been at so low an ebb as during the short reign of the young Emperor. An awakening had shown itself among the Chinese people, which might be described as a shaking among the dry bones. Newspapers in the Chinese language had increased in two or three years from seventeen to seventy-six. The publications of the Society for the Diffusion of Christian and Useful Knowledge, consisting, not of "Christian Science," but Science Christianized, increased within the same time from $800 to $18,000. The whole people were penetrated with a desire for progress, and though they had been recently beaten in war by the Japanese, they proposed to imitate their victorious enemies and learn the best lessons of the West as the surest way of rehabilitation. When the Marquis Ito visited China, a little more than two years ago, I complimented him on the influence which his country was exerting on China in consequence of being her nearest neighbor. I compared it to the tide, raised by the moon, as our nearest neighbor in the solar system; but I took care not to hint that his country, like the moon, was shining by borrowed light. Yet it is true that the reforms which China and her young Emperor so much admired were borrowed at second hand from these United States.

Immediately on the occupation of Kiao Chau, the Germans proceeded to lay out railways in different directions across the province of Shantung, which they claimed as their sphere of influence, and which some of their newspapers, by way of anticipation, described as "German China." The natives were aroused much more by these enterprises than by any abstract question of infringement of territorial rights. To them it appeared horrible that the

spirits of their ancestors should be waked by the snorting of the iron horse, and that cemeteries should be desecrated by the passage of the iron road. They everywhere set upon the engineers and impeded the prosecution of their work. The most active in leading this opposition were the members of a secret society called "Boxers."

That society is not a new one called into existence, as has been supposed, by the work of missions; on the contrary, it gave trouble more than a century ago to the Chinese Government, and in 1803 was formally placed upon the Index of forbidden associations. Since then it has languished in obscurity until recent events called it into life and until the favor shown it by the Empress Dowager transformed it into a great political party. The doctrine to which it owes its existence is not orthodox Confucianism, Buddhism, or Taoism, but a superstition based on hypnotism, mesmerism, or spiritualism, as it is variously called. Among its members are many whose nervous condition fits them for spiritualistic mediums, and through these the Society gets oracles from the unseen world. They undergo a species of drill, which is intended to enable each member at will to go into the trance state. When in that condition they profess to be endowed with supernatural strength and rendered bullet-proof. These mysteries, so piquant to the curious at all times, were particularly attractive in view of possible hostilities with foreign nations. The organization spread like wildfire among the people of Shantung, and the Manchu Governor, Yuhien, finding in these people an auxiliary force, supplied them with arms.

The Empress Dowager, and Prince Tuan, father of the heir-apparent, encouraged them to come to the capital. In their devastating march they killed missionaries and laid waste Christian villages, nor did they abstain from many a village which was not Christian, but which excited their cupidity by the spoils which it offered. Reaching the vicinity of the capital, they tore up the railways leading to the west, and burned down the stations near the city. Then it was, not till then, that the Ministers in the capital awoke to the seriousness of the situation. Missionaries had been uttering their Cassandra warnings, but the Ministers always turned for information to the Tsung Li Yamen, the official organ or Foreign Office of the Chinese Government. They were there told that these Boxers practised an innocent kind of gymnastics, and if they did sometimes show themselves turbulent and disposed to quarrel with native Christians it was not without cause. But the Empress Dowager intended shortly to issue a

decree dismissing them to their homes. Such decrees were issued, accompanied by secret instructions not to regard them.

The meaning of the destruction of the railway was not to be misunderstood; the Ministers, without waiting for the consent of the Chinese Government, ordered a guard of marines to be sent up from the sea coast, and they arrived not a day too soon. The next day the railway to the east was also broken up, and had their arrival been delayed forty-eight hours no foreigner in Peking would have lived to tell the tale. There were only three hundred and fifty, all told, but their mere presence for a time held our enemies in check, and they served eventually to make good the defence of the Legations. On the 11th of June, a fortnight after their arrival, an attaché of the Japanese Legation was killed at the railway station by Boxers and Chinese soldiers combined. This may be regarded as introducing the first stage of the siege. For the next nine days the Boxers were specially prominent, setting fire not only to churches and mission houses, but burning up all the native storehouses which they suspected of containing foreign goods. Square miles of ground were left by them covered with the ruins of the richest business houses in Peking. On the 19th of June, a circular from the Foreign Office informed the Foreign Ministers that the Admirals had demanded the surrender of the forts at the mouth of the river. This, said they, is an act of war. You must now quit the capital with all your people within four-and-twenty hours. The Ministers agreed to protest against the severity of this condition. The first to set out for the Foreign Office with this purpose in view was Baron Ketteler, the German Minister. No sooner had he reached the great street than he was shot in the back by a man wearing the official costume of the Chinese Government, and fell dead. His interpreter was wounded, but succeeded in making his escape and giving the alarm.

The other Ministers believed that a general massacre had begun, and with their people, who had already taken refuge under their several flags, they fled precipitately to the British Legation, which, having been the residence of a high Prince, covered a large space of ground, and was surrounded by strong walls, forming a citadel capable of defence. It had accordingly been agreed upon as a place to make a stand in the last resort, and Sir Claude McDonald not only generously welcomed his colleagues but received all their people, whether civilian or missionary. The missionaries were accompanied by their converts, Catholic and Protestant, to the number of near two thousand. For the converts an asylum was

secured in the grounds of a Mongol prince on the opposite side of a canal from the British Legation. Professor James, the man chiefly instrumental in securing it, was himself slain by the enemy in the afternoon of the same day. Had the enemy followed up their advantage, they might, perhaps, in the midst of our first confusion, have overwhelmed all the Legations; but they feared to come to close quarters. Some of the outlying Legations were destroyed by fire, but most of them were included within our line of defence. None of them, however, except the Legation of Great Britain, was considered safe for the residence of a diplomatic family.

Within the gates of the British Legation, which covered six or seven acres of ground and contained twenty or thirty different buildings, were congregated nearly one thousand foreigners, and from this time for eight weeks we were closely besieged, not by Boxers, but by the soldiers of the Chinese Government. That very evening, at nightfall, they opened a terrible fusilade, and this was renewed day after day, chiefly under cover of night, so that we came to speak of it rather contemptuously as a "serenade." It was not, however, altogether ineffective, for day by day some of our men were killed or wounded, and in the sorties, which were occasionally made to drive our assailants back or to silence their batteries, the casualties were always serious. What we most dreaded was the firebrand, and when the ruthless enemy, with more than vandal ferocity, set fire to the library of the Imperial Academy, for the purpose of burning us out, we all had to assist in fighting the flames. Women and children, including the wives of Ministers, passed buckets from hand to hand. A change of wind came to our aid and the Legation was saved. At first the enemy assailed us only with fire and small arms; gradually, however, they got guns of considerable calibre in position and at all hours of the day attacked us with shell and round shot. Mrs. Conger, wife of the Minister, in whose family I was kindly received as a guest, had embraced the ideal philosophy of Bishop Berkeley, and looked on all this pyrotechny as a play of the imagination. I envied her the comforting delusion, for when I went out and picked up a six-pound round shot I found it too heavy and solid to be resolved into a fancy. Whether owing to her philosophy or to her Christian faith she is one of the most admirable women I ever knew; calm and unperturbed in the midst of danger, she realized the description which Pope gave two hundred years ago of his ideal woman, as "Mistress of herself though China fall."

Mr. Conger, an old soldier, who fought through all the years of our Civil War, and marched with Sherman from Atlanta to the Sea, met the trials and exigencies of this occasion with becoming fortitude and cool judgment. Diplomatist as well as soldier, he knows how to deal with the most serious questions that confront him as negotiator in this Chinese problem. His daughter, Miss Conger, had visited many water-cures in quest of health. The fire cure, to which she was now exposed, proved to be the required remedy. On the first fire she threw herself weeping into her father's arms; the next day she listened to it calmly, and then from day to day she seemed to acquire new strength, until she came out of the siege restored to perfect health. If I be asked how we spent our time, I answer—there was no frivolity and no idleness. Every man had his post of duty; mine was to serve as Inspector of Passes at the Legation gate for Chinese going back and forth between the Legations within our lines. There it was my sad lot to see many fine young men go out full of life and hope to come in wounded, maimed, and dying. We lost in all, killed and wounded, more than a third of our number. If we were asked what we lived on, I answer—the coarsest of bread and the poorest of meat. The meat was that of horses, varied by an occasional mule; even that was so reduced in quantity that only three ounces per diem were allowed for each individual. Milk was a luxury, even condensed milk beyond our reach, and no fewer than six or seven infant children perished for want of it. While the men fought or mounted guard the women made sand-bags from day to day to the number of many thousands for the strengthening of our fortifications, and by their calm demeanor and hopeful words they strengthened the arms of their brave defenders. On one occasion it was deemed necessary to make a desperate effort to regain possession of a portion of the city wall which dominated these Legations. A company of some sixty men—American, British and Russian—was formed under the lead of Capt. Myers of the U. S. Marines. When ready to make the attack, and hoping to take the enemy by surprise, he made a short speech: "My men," said he, "within yonder Legation there are three hundred women and children whose lives depend upon our success; if we fail they perish and we perish with them; so when I say 'GO,' then go." The Americans and English were thrilled by his words, and the Russians understood his gestures. All felt that it was a forlorn hope, and all were ready to lay down their lives to insure success.

The movement proved successful, and that portion of the wall

remained in the possession of our men until our rescuers entered by the water-gate beneath it.

When the siege began we expected relief in a few days; but when Seymour's column was driven back we tried to wait with patience for the coming of the grand army under the eight banners. Yet so closely were we shut up that we had almost no information as to its movements, and our souls were sickened by hope deferred. At length, when our rations had run almost to the lowest ebb, when we had horse meat for only two days more, and bread for no more than a fortnight, so that starvation actually stared us in the face, one night, on the 14th of August, a sentry rushed into Mr. Conger's room, where I also was trying to sleep, and cried out: "They are coming. They are coming. The army of relief. I hear their guns!" The Minister and I were soon in the open air; we did not wait to put on our clothes, for we had never taken them off. We heard the machine guns playing on the outer wall; and never did music sound so sweet. It was like the bagpipes of Havelock's Highlanders to the ears of the besieged at Lucknow. The ladies were wakened, and soon men and women poured out from all the buildings and listened with irrepressible excitement to the music of the guns. Women threw themselves on each other's necks and wept, while men grasped hands with feelings too deep for utterance.

The next morning the great gates of the Legation were thrown open, and in rode a company of Indian cavalry. They were, I thought—and I have no doubt every one of our besieged garrison thought the same—the finest men I had ever looked upon.

The siege was ended. The rest of the army entered by the great front gate of the city, the key of which had been captured from the flying enemy by Captain Squires, of our Legation, who is one of the heroes of the siege. The next day we all joined in singing a Te Deum in the tennis court of the Legation, and Dr. Smith in a short address pointed out ten circumstances in each of which the finger of God was visible in our deliverance. He might have extended them a hundred. After thanking God, it only remains to thank our noble President for having despatched the army and navy to our succor without waiting to call an extra session of Congress. I feel proud of my country for the record she has established on this occasion—not only taking her place among the great Powers, who have interests as wide as the world, but showing that her arms are long enough to protect and rescue her people in all parts of the globe.

The curtain has not yet fallen on the last scene of this tremen-

dous drama. The Empress and her court fled the city, almost at the moment when our troops entered it, and she has taken refuge at an old capital in one of the northwestern provinces. Whether the government will be re-established at Peking is highly problematical. For my own part I think the restoration of the young Emperor, who might carry out his progressive measures under the supervision of the Great Powers, offers the best solution. The integrity of the Empire would then be maintained, and possible conflicts between European claimants averted.

China must, of course, pay a heavy war indemnity. It is understood that not only the foreign nations, but individual foreigners, will be indemnified. But no assurance is given that any compensation will be made to native Christians whose houses have been burned and whose relations have been slaughtered. Diplomatists and military men have joined in acknowledging that but for the bone and muscle supplied by those native Christians the defence of the Legations would have been impossible. Though they performed the humble office of navvies in building barricades, digging trenches, and countermining against the enemy, their services were indispensable to the common safety.

> "Heaven framing, each on other to depend,
> Bade each on other for assistance call,
> Till one man's weakness grows the strength of all."

I cannot believe that any Christian country will consent to the gross injustice which is involved in excluding them from the provisions of the indemnity clause.

The greatest enemy to the orderly and profitable intercourse of nations is heathen darkness. Of Pagan superstition we may say:

> Unglaube du bist nicht so viel ein Ungeheuer,
> Als Aberglaube du!

No restriction, therefore, should in any way be placed on the operations of missionary bodies who seek to dispel that darkness and to diffuse the light of science as well as religion. Without these our railway and mining enterprises will be insecure, and we can have no assurance that that monster, the dragon, who has now been cast down before the Soldiers of the Cross, will not again raise his head and bring about another catastrophe similar to that which has so lately horrified the world.

AKARNANIA AND ÆTOLIA.

BY

RUFUS B. RICHARDSON.

Since I took my first hasty glimpse of Akarnania and Ætolia in 1894, that region has drawn me powerfully, and I have made four other visits there, more careful and of longer duration than the first, the peculiar charm which I felt at first strengthening its hold upon me with each fresh visit.

It is a neglected corner of Greece. Not one in five hundred of the strangers who visit Greece thinks of paying it a passing visit, although for ten years the Northwestern Railway has made it possible for one to leave Athens in the morning and lodge the same night at Agrinion, in the heart of Ætolia. Whether the projected extension of this railroad from Agrinion to Arta, the ancient Ambrakia, will alter this state of things may well be doubted. Fate seems against this paradise—for paradise it is. One coming from Attica or Argolis wonders at the large shady oak groves and the broad, flowing rivers (most rivers in Greece are simply dry beds), and asks, Why don't the Greeks flock from the barren hillsides and dry plains of Eastern Greece to till this rich soil and build towns? It is also wonderfully picturesque. Here is a lake ten miles long and four miles wide—a rare thing in Greece—with high mountains a little removed, for a background on its long sides. But nobody seems to enjoy it. Not until my third visit did I see a single boat on that inviting water. Here, too, are springs of the coolest water, flowing abundantly, and nobody to drink from them, while *πολυδίψιον* Argos, and still drier Athens, are crowded with people wrangling over the question how they shall get the water absolutely necessary to keep the cities alive.

It is true that the richness of the soil has been recognized to some extent. Agrinion has become a thriving town of ten thousand inhabitants, and the centre of the tobacco industry in Greece. There are also stretches along the edge of Lake Trichonis that are almost as full of fruit trees of all kinds as is the famous Lelantine plain between Chalkis and Eretria. Mesolonghi and Anatoliko are prosperous towns on the shore of the lagoon which cuts deep into Ætolia. But in general the villages are small and far apart. One traverses the distance of thirty miles between Agrinion and the Ambracian Gulf, on the main highway, without passing through a single village, although the wretched hamlet of Sourovigli, which

is crowded into the ruins of Stratos, the capital of Akarnania, does lie close to the road.

The climate is as healthy as the soil is fertile; life and property are as safe as anywhere in Greece; and yet population does not drift that way. There is no other word but *fate* to account for this neglect of a land of such natural attractions. It seems given over to those travellers who like to feel that they are off the beaten track, who take delight in scenery that has not been enjoyed by all the world and described to death, and who can take the discomforts of bad inns and lively beds as a piquant sauce in the feast.

Perhaps the most striking feature in this fate is that it has been operative from time immemorial. Just as Ætolia and Akarnania are not included in the modern Baedeker, they were also left out of the ancient Baedeker, Pausanias It is a territory about equal in extent to that of Attika and Bœotia; and yet while Attika has filled the world with its fame and permeated it with its influence, and while Bœotia has given us Pindar and Plutarch and Epaminondas, there has been no Ætolian or Akarnanian whose name has found a place in the world's book of fame. That a sort of rough honesty went with their destiny obscure is, in the case of the Akarnanians at least, amply attested. The Ætolians, too, who used to be regarded as a sort of robber brood, unfit to be counted with civilized Greeks, did show so much character in the later days of degenerate Greece in annihilating the hosts of invading Gauls, and in offering some real resistance to the Roman legions, that one questions whether they would not have made more of a showing if they had had one poet or historian to magnify or even to record their deeds. It is the bard who makes famous. How reverentially we follow in the footsteps of the bard!

From this lack it has come about that, whereas in other parts of Greece the search has been for sites that correspond to names famous in song and story, in Ætolia and Akarnania one has to seek—often in vain—for a name to fit a most imposing ruin. Two notable illustrations of this principle may here be adduced.

By the northern shore of Lake Trichonis, on a foothill of the great Ætolian mountains to the north, is an acropolis which is a masterpiece of fortification, with a walled town of considerable dimensions stretching from it down to the lake. For this imposing ruin practically each topographer who has busied himself with the region has proposed a separate name, always with some reserve. It has become an item of interest when a new article or a new book appears treating of Ætolia to observe what name the writer will

give to this ruin near the modern village of Paravola. The latest writer on the subject* says:

> Bazin suggests that the place was called Boukation—a name only mentioned in an inscription found in the neighboring ruins at Krionerou. This is the most satisfactory identification hitherto proposed; in the present state of our knowledge it is the only one possible, but beyond that no more can be said either for or against it.

The second case is that of the justly admired acropolis called Vlocho, about five miles back from the north shore of Lake Trichonis and about the same distance east of Agrinion. Vlocho deserves to be called a fortified mountain rather than an acropolis. It is half as high again as Acro-Corinth; and even Ithome falls considerably short of it. Of all the acropolises of Greece only the Arcadian Orchomenos overtops it by a few hundred feet, and is not nearly so impressive, because it reaches its height of over three thousand feet by starting from a plain already considerably over two thousand feet above the sea-level.

When Col. Leake, the great pioneer topographer of Greece, in 1805 saw this citadel, made impregnable both by nature and art, he felt that this, and no other, was Thermos, the capital of Ætolia. He says:

> I have not entertained the supposition that Thermos could have occupied any other site than that of Vlocho, the description of Polybius, but still more the magnitude of the ruins, leaving scarcely a reasonable doubt on this head.

And yet in order to identify Vlocho with Thermos he had to do the greatest violence to the words of Polybius, who, in describing the forced march of Philip V. of Macedon, in which he broke camp on the Acheloos, near Stratos, at daybreak, and reached Thermos at evening in season to sack it before nightfall, says that he marched with his left protected by Lake Trichonis. Leake, a soldier himself, saw that no mortal soldiers could have started from Stratos and made the entire circuit of the lake—over very rough ground, too, some of the way—and reached Vlocho on the same day. But with the prepossession above mentioned, he changes the word "left" in the narrative of Polybius to "right," with the remark:

> The only conclusion seems to be that the words right and left have, by some negligence either of the historian or his copiers, been substituted for each other in the text. Experience proves that such an error, notwithstanding its importance, is one of the most common that occurs.

The last part of this remark is certainly true; and Leake has in other cases detected such an error, and earned by it praise and thanks. But in this case Vlocho had thrown a spell over him, and closed his eyes to one very important consideration, viz.: that the

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* W. J. Woodhouse. *Ætolia: Its Geography, Topography, and Antiquities.—Clarendon Press,* 1899.

distance from the Acheloos below Stratos to Vlocho is so short that the famous forced march of Philip, which lasted from dawn till nearly evening of a long summer day, is reduced to about ten miles!

The conclusion ought to have been obvious that Thermos was not at Vlocho, and in spite of Leake's reputation for infallibility, which he almost deserved, there have never been wanting topographers who boldly looked Vlocho in the face, and said such a citadel *ought* perhaps to be Thermos, but it is not. If challenged to give some adequate name to it they frankly confessed inability, but were contented to search for Thermos somewhere near the east end of Lake Trichonis, a place capable of being reached by the forced march along the south shore of the lake, as Polybius describes it.

In the spring of 1897, when the war-cloud was hovering over Greece, I visited the ruins called Palæo-Bazari, near Kephalovrysi, with Charles Peabody, a former member of the American School; and so convinced were we that there and there only were the ruins of Thermos that he desired to put our conviction to the test by a small excavation enterprise, for which he was willing to contribute $500. I applied to the authorities for the concession of the site, and received an oral assurance that we could have it. But the war-cloud had already burst before we had got back to Athens; and all archæological undertakings were relegated to the rear. Within less than a year a fortunate Greek, who had gone over into Ætolia with powers to explore whatever he pleased, made his first trial at this very spot; and long before he had spent the equivalent of $500 he had abundant and incontrovertible evidence, particularly inscriptions, that he had found Thermos.

This happy man, Georgios Sotiriades, has already carried on three excavation campaigns there; and as everything lay very near the surface, the work went rapidly. Perhaps never in Greece has so great a result come from so little outlay of time and money. I felt some disposition to envy; but in the archæological circles at Athens envy is unknown. Each man sets down his neighbor's success as contributing to an end which all are striving for. Then, too, we were having good luck at Corinth. But when I was dealing with my twenty-five feet of earth I could not help envying the man who had to deal with only four feet. Mr. Sotiriades has just filled the last number of the Greek Archæological Journal with a part of his splendid results, making one of the most important contributions to the history of archaic art.

But questions about art take us too far afield from our topography. Sotiriades, having found Thermos, could have left others to find a name for Vlocho. But he has done something towards

this also by finding an inscription on the slope of the mountain, which showed that it was the stronghold of the Thestieis, who once held the rich plain of modern Agrinion, and who, if we can judge from the legends which connect the name of their ancestor king, Thestios, with Meleager and the Calydonian Boar Hunt, were the original Ætolians—the Eteo-Ætolians. It is true that we come out with an anti-climax in this mere tribal name, which must be accepted for Vlocho. Such a place ought to have had a name as famous as Thebes; but it lacked the historian, and above all, the bard.

On the Akarnanian side of the Acheloos rises a hill in the marshes. It is an irregular hill, or rather a combination of several hills, that once constituted an island. Indeed, it has a harbour, which now looks strange several miles inland. A wall with innumerable turns, and pierced by many gates of diverse structure, encloses the entire hill. The total length of the wall is about four miles, and constitutes the most extensive fortification in Greece. But, lying rather low, it does not attract the gaze from afar as does Vlocho. This is Œniadæ, not the capital, but perhaps the most important city of Akarnania. Such walls as these seem a title to fame; and yet Œniadæ has almost no history transmitted to us. Pausanias devotes a chapter to an episode in its history in his "Messeniaca," in which he describes how the Messenians, expelled from their homes by the Spartans and settled by the Athenians in Naupaktos, wished to show that they owed their low estate more to unkind fortune than to any lack of courage, and so without provocation attacked this stronghold, took it away from the Akarnanians, and held it for a whole year against their combined attacks.

The isolated position of Œniadæ in the marsh, and its consequent inappropriateness for a Byzantine or Frankish fortress actively controlling the surrounding country, has prevented that long occupation of mediæval and modern population which always proves so destructive of ancient remains. It would, therefore, not be surprising if excavations should here bring to light a good deal of the ancient city, which cannot be very deeply buried. Akarnania is as likely to have been an art region as Ætolia; and the amount of objects of art found at Thermos, remaining over after the systematic pillage of Philip V., encourages the hope that something good may be found at Œniadæ. The theatre is protruding out of the ground, and so affords a starting-point. Near by is a terrace that may well hold the remains of a temple. The Greek Government has granted the American School the privilege of making a trial excavation here this winter.

CAPTAIN FABIAN GOTTLIEB VON BELLINGSHAUSEN, 1819–1821.

THE DISCOVERY OF ALEXANDER I., PETER I., AND OTHER ISLANDS.

BY

F. A. COOK.

While the American sealers were swarming in the Antarctic waters and searching every rock for fur seals, two Russian exploring vessels suddenly appeared among them. These were the *Vostok* and the *Mirny*, commanded by Captains Bellingshausen and Lazarew. It is unfortunate that the record of this important expedition was published only in the Russian language, for, because of this, the far-reaching results have been largely lost. The Russian voyage is marked on the Admiralty charts, but all the chroniclers to the present time have either omitted this voyage or passed it over by a few vague statements. Bellingshausen and Lazarew made one of the most notable voyages in the Antarctic, and they deserve to take their place in the first rank of South Polar explorers. They gained for Russia the honour of having discovered the first land beyond the Antarctic Circle. They circumnavigated the globe closer to the regions of perpetual ice than did Captain Cook, and altogether the Russian Antarctic efforts are to be classed as second only to those of Cook and Ross.

Baron Fabian Gottlieb von Bellingshausen was captain of the *Vostok*, and commanded the expedition. He was one of the officers of Admiral Krusenstern's staff on a voyage around the world in 1804, and this Antarctic voyage of Bellingshausen's was one of several enterprises fostered by the Russian Government to display the increasing strength of its navy. It is not known whether the Russians were ambitious to find sealing grounds in the far south, but it is probable that they expected to find new regions comparable to those of the Bering Sea area.

The two vessels, the *Vostok* and the *Mirny*, were slow, cumbersome sailing crafts. They left the Russian harbor of Kronstadt in 1819, and Bellingshausen was instructed by Alexander I. to push as far south as possible. The vessels were sailed down the Atlantic, and on December 15th South Georgia was sighted. Sailing around

the southern termination of this land, the commander next took a course southwesterly for Cook's Sandwich Land. On this track he discovered a lofty island on January 3, 1820, the position of which was latitude 56° 41′ S., and longitude 28° 9′ west of Greenwich. On the following day two more islands were discovered. To this group of three islands was given the name Traversey Islands, in honor of the Russian Minister of Marine. One of them was an active volcano, and this was named Savadovskii.

On January 8th, Bellingshausen reached the Candlemas Islands, the most northern group of Sandwich Land. After cruising here for a few days, Bellingshausen was convinced that Cook's discovery was not a part of a large land, but a detached group of small islands far away from any mainland. Continuing southward, the vessels were forced through fog and storm over a rough sea to the edge of the pack-ice. After reaching 60° 10′ S. on longitude 28° W. the sea was so closely packed by drifting ice that it was necessary to retreat northward. A second attempt was made further eastward and proved equally unsuccessful, but in a third attempt made still farther eastward, he was able to take a course almost due south to latitude 69° 21′ S. on longitude 2° 15′ W., where he was stopped by an impenetrable pack on January 28th. Again the vessels were pushed northward and eastward, and on February 2d they were on longitude 1° 11′ W. and latitude 66° 25′ S. Here the ice was also closely packed and the course was laid still farther eastward, always in the hope that an opening would be found poleward. At latitude 65° S. and longitude 18° E. the wind and ice seemed more favorable, and here another effort was made to push into the frozen south.

Through waters fairly free of sea ice, though liberally strewn with large icebergs, the vessels were forced to 69° 6′ S., where they were again stopped by closely-packed ice. During February 17th and 18th successive efforts were made to find a passage southward; but the south was everywhere guarded by an endless sea of ice, which it was found impossible to navigate. On the 19th all attempts at farther progress were relinquished and a course northward accordingly set. As they turned from the ice a sea-swallow (*Sterna*) was observed, and the bird was taken as an indication of a proximity to land. Their position, at the time this bird was seen, was latitude 68° 5′ S., longitude 16° 37′ E. Sailing eastward, a course was laid somewhat south of latitude 65° to longitude 34° E., and then pressing a little southward at 40° 56′ E., latitude 66° 53′ S. was attained. Here the ice was again found so dense

that further attempts to penetrate it were thought to be useless. The course was now continued along latitude 62° 30′ S. as far as longitude 69° E. Here Bellingshausen took a more northerly course, but still somewhat below 60° S. to 88° E., from whence, in the latter part of March, while surrounded by drift ice and hampered by fog and storms, he laid a course for Port Jackson (Sydney), New South Wales.

The southern winter was spent in exploring the Paumotu group, and, as the summer advanced, Bellingshausen left Sydney for another Antarctic cruise. His course was, at first, almost due south. On December 10th, 1820, he encountered the first icebergs in latitude 62° 18′ S., and longitude 164° 13′ E., and soon after a dense pack barred progress, whereupon a more easterly course was set. This pack differed from that which was seen during the previous season in the larger number and increased dimensions of the icebergs mixed with the field ice. One of these huge table-topped masses was estimated to be seven miles long. The voyage was continued to the eastward, and the number of icebergs still increased—so much so that at one time upwards of one hundred were counted from the masts. After many trying experiences in navigating ice-strewn seas through fogs and tempests, Bellingshausen at length reached what seemed to him to be the end of the pack-ice, for on December 14th, beyond to the south and east, there was an open sea full of promise. Sailing continually over these waters eastward crossing the Antarctic Circle, and always edging southward with every favorable wind, at the end of a week he was again confronted by the discouraging line of impenetrable ice. Again large numbers of great icebergs were seen, one of which is said to have been eleven miles long.

Returning a second time to 60° S., the vessels were forced eastward; but soon their course was again set southward, and on longitude 120° W., latitude of 67° 50′ S. was made on January 13th, 1821. Again they were headed off by a dense pack-ice, and again they returned northward to 63° S., where they continued to press to the eastward. On 103° W. longitude, Bellingshausen crossed the Antarctic Circle for the sixth time.

The farthest point south reached by the Russians was here attained in an easterly cruise along the pack edge. Led on by a remarkably bright iceblink, they penetrated a bight in the pack at longitude 92° 19′ W., and reached latitude 69° 53′ S. on January 22d. Here, however, Bellingshausen was again compelled to seek the more favorable waters northward, because of the unyielding pack

to the south and the dangerous tongues of drift-ice about him, which threatened to ensnare the ships. While steering northward from their farthest south the explorers perceived, far to the eastward in the afternoon of the same day, a small dark spot, which quickly aroused their interest. As the weather cleared, this spot was made out to be a high, snow-covered land. The vessels were hove to, and on the following day, by a nearer approach, an opportunity was afforded for a more careful survey of the land.

The newly-discovered land proved to be a single island, with an estimated altitude of over 4,000 feet. It was called Peter I. Island, and its position was fixed at latitude 68° 57′ S., longitude 90° 46′ W. Being convinced that more land was to be found in this region, Bellingshausen sailed eastward at a safe distance from the pack-edge in latitude about 68° 30′. On January 29th, 1821, his anticipations were realized, for, looking eastward far beyond the pack-ice, he saw what to him appeared like the coast of a large country, offering a prominent cape. Though eager to make a closer examination of the land, it was found that the pack-ice would not permit a nearer approach than a point forty miles to the west. The discovery was named, in honor of the Tsar, Alexander I.'s Coast, but it has been charted Alexander I. Land. The most prominent cape seen from Bellingshausen's position was placed on latitude 68° 43′ S. and longitude 73° 10′ W. From here a course was set northeastward, at some distance from Graham Land, to the South Shetland Islands, where the American sealers were met. The homeward voyage was by way of the South Orkneys and South Georgia, and Kronstadt was reached in July, 1821. Bellingshausen thus completed in two years a most successful voyage of exploration around the world in high southern latitudes.

In the French and the Russian mind there still survived a faint belief in a great Austral continent, but this sweeping voyage of Bellingshausen and Lazarew dispelled the last hope of discovering any large and commercially useful land towards the south pole.

The *Belgica* sailed somewhat closer to Alexander I.'s Coast, and upon her I made the following entry in my log:

S.S. *Belgica*, February 16th, 1898.

At noon our latitude is 67° 58′ south, the longitude 69° 53′ west of Greenwich. We haul a little westward of the outer drift of the pack, and Alexander Land rises up over our port bow, still forty or fifty miles away. There are scattered in the waters westward, and in the pack eastward, forty-four icebergs of moderate size. About half of these are tabular in form; the other half are of the pin-

nacled and sea-washed or weather-worn variety. A few small black-billed penguins are in the water, darting over the surface and again into the deep with electric swiftness. Close to the pack-ice there rises from the black surface of the sea a number of columns of vapour-like jets. Through our glasses we see under these the blue-black backs of whales, with large dorsal fins, and occasionally a ponderous tail whips the water into a foamy whirlpool. On some of the pans of ice are seals basking in the sun, and over the ship, apparently touching the masts and the ropes as the bark rocks to and fro, are giant petrels, Cape pigeons, gulls, white, brown, and blue petrels, all pointing their bills and stretching their necks to examine, perhaps for the first time, human beings and their crafts.

There is a dreamy stillness in the air, in spite of the frequent stir of wild life, and a charming touch of colour to the sea, the ice, and the land, though the sky is dull, gray, and gloomy. At first glance all seems white and black, and we are impressed with the weight of the awful snowy solitude into which we are entering. A sense of chilly loneliness is more and more forced upon us by the passing panorama of snow and ice and deserted rocks. But, critically considered, after the first pangs of desolation have passed there are a few of us who find cheer and fascinating colour in the harmony of the perennial chilliness before us. This morning there was a break in the clouds, and through this came a flood of yellow light which made the bergs studding the sea and the icy cliffs of Alexander Land stand out like walls of gold. Shortly after noon a pale blue was thrown over the white glitter of the pack, which increased the high lights, darkened the shadows, and made the moving mass of whiteness, as it rose and fell with the giant wave of the sea, a thing of gladness.

At four o'clock in the afternoon we had made a rough outline of the new land before us. It proved to be a group of islands (Alexander Islands) about twenty-five miles long and from ten to fifteen miles wide. There is one large central island, about eighteen miles long, with a high ridge of mountains running approximately from east to west. In this ridge there are three peaks, not less than four thousand five hundred feet in altitude. These are quite pyramidal in form, and are covered with snow to their summits, with only an occasional bare, perpendicular rock. This ridge of mountains tapers gradually towards the west and terminates abruptly in the east. Running parallel to this central ridge, about four miles southward, there is a lesser chain of mountains, about two thousand feet high, whose sides sink almost perpendicularly into

the sea. There is also a similar ridge to the southward. The two valleys between these three ridges of mountains are filled with great streams of glacial ice. We had a splendid view of these glaciers as we passed about twenty miles off the western end of an island. The northern valley is rough, much crevassed, and generally irregular, extending its tongue out over the sea for several miles. The valley south of the central ridge appeared like a great plain, with easy slopes towards the sea, where the frozen mass seemed to project over the waters for a short distance. Around this one large island are a number of small islands—angular, rocky masses, mostly covered with caps of glacial ice. These, from a greater distance, appeared to be a part of the main central land mass. The vast numbers of icebergs to the eastward of the land gave it also, from a greater distance, the appearance of being connected with some larger land; but from our various positions we were able to make out distinctly that the islands are a separate group, with no other land within sight to the east. Our positions —northward in the morning and southward during the night— proved this. We saw some signs of land to the south during the afternoon, but these vanished later. It was evidently a mirage.

ST. CHRISTOPHER, WEST INDIES.

BY

W. H. ALEXANDER.

A correct and reliable knowledge of the West Indies is obtained only by a careful study of each island composing the group. The individual peculiarities of each island constitute the most surprising, and certainly not the least interesting, feature of this study. This island-peculiarity characterizes to a greater or less degree the geology, the geography, the climate, the flora, the history, and the occupations of the people. Of course, there are some things which may be truly said of the whole group; but these general statements are fewer and less trustworthy than is generally realized. In the hope, therefore, of contributing something of real value to the much recently written about the West Indies, this paper is prepared, taking for consideration the little island of St. Christopher, or St. Kitts, as it is very generally known.

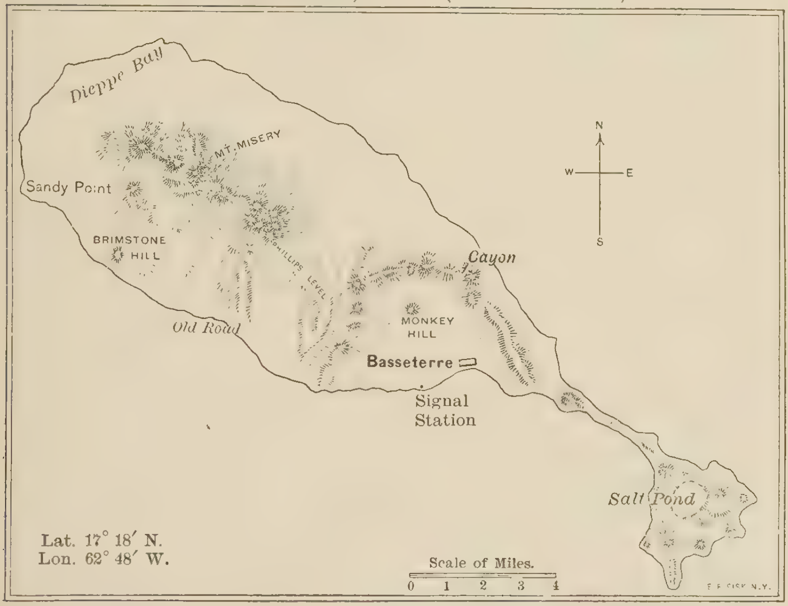
This island has a most charming political history; but it would be foreign to the main purpose of this paper to follow this line further than to say that at the time of its discovery, in 1493, it was inhabited by the fierce and war-like Carib Indians, among whom the island was known by the name of *Laimuiga*, meaning the fertile. Columbus, the discoverer, however, chose to call it St. Christopher, which name it still bears, notwithstanding the English tried many years ago to give it the name of St. Kitts. It must be confessed that the Indian name is the more appropriate. To the English, led by Sir Thomas Warner, belongs the credit for its colonisation, which began in 1623. It is the oldest English settlement in the West Indies. To establish and maintain this colony, and to acquire an undisputed title to the island, England has given freely of both blood and treasure; and it is not too much to say, perhaps, that no other one of her present possessions, considering its size and relative importance, was so dearly purchased. The island is now an English Crown Colony, being one of the "Leeward Islands," the seat of government of which is at Antigua. Local affairs are under the direction of an Administrator, aided by a Council.

Geologically considered, the island is of volcanic formation, as abundantly shown by the presence of thick layers of volcanic scoriæ,

known as *lapidi.* These ashes or cinders are found near the surface, and at great depths, in all parts of the island. At Sandy Point, for instance, layers of volcanic dust alternate with layers of soil for a depth of seventy-five feet, on a substratum of gravel. The soil is a dark-grey loam, very porous, and highly adapted to the cultivation of sugar cane. Clay may be found in the high lands, but not in the low.

The accompanying outline map gives a very correct idea of the geographical position and topography of the island. As indicated thereon, the central portion is occupied by a range of lofty, rugged mountains, crowded together, as it were, and intersected here and

ST. CHRISTOPHER, W. I. (W. H. Alexander)



there by rocky precipices. The culminating point of this mountain range is near the north end of the island, and is known as Mount Misery. This mountain is more than four thousand feet high, and is an extinct volcano, the crater of which is regarded as one of the most interesting features of the island, especially by tourists. From fissures in the sides and bottom of this crater issue constantly sulphurous fumes, and some places are too hot to stand upon with comfort—the water in some of the springs being hot enough to cook an egg. There is also within the crater a beautiful lake. From the "lip" of the crater to the bottom is about 600 feet.

From the southeastern end of the main body of the island extends a long narrow neck, which spreads out fan-like, and upon which rise a number of conical hills and mountains. The entire length of the island is about twenty-three miles, and the average breadth of the main body is about five miles, giving a total area of something like sixty-eight square miles, of which only about 13,400 acres are suitable for cultivation, the remainder being used as wood and pasture lands.

The climate of St. Christopher, for a tropical one, is decidedly healthful and temperate, being absolutely free from extremes of heat and cold. The average temperature for the year is less than 79° F., while the annual mean daily range of the temperature is less than ten degrees. The month of February, closely followed by the month of March, is the coolest month of the year—the average temperature being about 76° F., and the average daily range less than nine degrees. The month of August, with an average temperature slightly above 81° F., and an average daily range of less than nine degrees, is the hottest month, with September not far behind. These summer temperatures may appear to be too high to be comfortable; but owing to the fresh and constant trades this heat is robbed of its otherwise oppressive nature, so that one does not often feel uncomfortably warm except when exposed to the direct rays of the sun. The records at the United States Weather Bureau at Basseterre show that the highest temperature for 1899 was 89° F., and the lowest 64° F., thus giving an absolute range of only twenty-five degrees. The same records show the relative humidity of the air to be about seventy-five per cent., on an average, for the year. Rainfall is frequent but not heavy; rains occur on an average of every other day. Records for many years back show the total rainfall for the island to average about fifty-nine inches for the year. From local causes certain parts of the island have much more rain than others. The fall is well adapted to the cultivation of sugar cane; the greatest amount falls in September and October, and the least in February and March. Taking it all in all, the month of May most nearly approaches the normal meteorological conditions for the year. The barometric range is very small, being less than .09 inch for the year. The prevailing winds are from the east, with an average velocity of about ten miles per hour. Situated, as it is, in or near the usual path of the West Indian hurricanes, the island is occasionally devastated by one of these. But this does not occur every year by any means; it is sometimes fifteen or twenty years between visits.

The island is also subject to earthquakes, but these are, or have been, comparatively harmless.

The present population consists of white, colored, and black persons—about 30,000 altogether. Practically, all of these depend upon wages earned by labor for a support. As the land is owned chiefly by persons residing elsewhere, very few of the people here are able to own or rent any land; and as the only industry of any consequence is the sugar industry, the business of the island is measured by this one crop: if the crop is good, and the price fair, all goes well; but if the crop is short, and the price of sugar low, then follows a most wretched condition of affairs, especially among the poor laborers. Owing to the depressed condition of the sugar industry and the short crop last year—due to the hurricanes—there has been quite an exodus of laborers from this island to the more prosperous ones. There have been efforts made to develop "minor crops," but without practical results. Many plants, such as cotton, tobacco, coffee, etc., do well here; but the owners of the estates do not seem to realize so much from these crops, and hence they are abandoned. There is no question that sugar is *the* crop of the island—better suited to the soil than any other.

At one time the exportation of salt, taken from the pond shown on the map, was both extensive and profitable; but, although the yield and quality of the salt are as good as ever, this industry has been abandoned.

A very great historic interest attaches to Brimstone Hill, as it was at one time a strong fort, and the scene of many bloody engagements. It has been abandoned for a number of years.

To attempt to convey an adequate idea of the exquisite beauty and vernal richness of the flora of a tropical island is positively hopeless: these must be seen to be appreciated. Particularly is this true of St. Kitts, which is often called the "Garden of the West Indies." Here may be seen plants and flowers in endless varieties; leaves and flowers of every hue and color; ferns, from the tiniest to the gigantic tree fern; fruits in great variety; useful woods and ornamental trees, vines, orchids, etc. To give a list of all these would be far beyond the limit of this paper.

I feel constrained, however, to mention a few of the fruits to be had on the island. Speaking in a general way, I may say that tropical fruits, as compared with the fruits of temperate climates, appear to be rather insipid, and one must "learn to like them" after using the fruits of the colder climates:

Bread Fruit—Artocarpus incisa.
Avocado Pear—Persea gratissima.
Mango—Mangifera indica.
Tamarind—Tamarindus indica.
Granadilla—Passiflora quadrangularis.
Belle Apple—Passiflora laurifolia.
Arnotto—Bixa orillana.
Banana—Musa sapientum.
Sapodilla—Sapota achras.
Cocoanut—Cocos nucifera.
Cassava—Janipha utilis and manihot.
Cashew—Anacardium occidentale.
Almond—Terminalia catappa.
Aloe—Aloe vulgaris.
Guava—Psidium montanum.
Pawpaw—Carica papaya.
Plantain—Musa paradisiaca.
Chenip—Melicocca bifuga.
Nutmeg—Myristica moschata.
Shaddock—Citrus Pompelmous decumana.
Orange—Citrus bigaradia.
Orange—Citrus aurantium.
Lemon—Citrus medica (varietas limonum).
Lime—Citrus aurantium (varietas spinosissima).
Icaco Plum—Chrysobalanus icaco.

In many cases there are several varieties of the fruit mentioned above.

NOTES ON CLIMATOLOGY.

BY

ROBERT DEC. WARD.

Recent Contributions to Antarctic Meteorology.—During the last few months a considerable number of papers relating to the meteorological conditions of the Antarctic have been published. Arctowski, the meteorologist of the *Belgica* expedition, has contributed to *Ciel et Terre* (Brussels) the following: *Résultats preliminaires des Observations météorologiques faites pendant l'Hivernage de la Belgica:* I. *Température de l'Air* (Aug. 1, 1899, 245–248); II. *Pression Barométrique* (Aug. 16, 1899, 269–275); III. *Roses des Vents;* and IV. *Phenomènes atmosphériques* (Oct. 1, 1899, 353–364). Arctowski has also published *Sur les Conditions météorologiques des Régions antarctiques* (*Ciel et Terre*, Oct. 16, 1900, 379–384), in which he compares the observations made by him on the *Belgica* with those made at Cape Adare on the Borchgrevink expedition. The meteorological results of the *Belgica* expedition have likewise been included in Dr. Frederick A. Cook's *Through the First Antarctic Night* (New York, Doubleday & McClure Co., 1900), in which the author also makes some interesting notes on the physiological effects of the Antarctic night, and have been briefly discussed by Supan in the *Meteorologische Zeitschrift* for May, 1900. Woeikof contributed a paper under the title *Arktis und Antarktis* to the *Meteorologische Zeitschrift* for February, 1900 (75–79), and Borchgrevink discussed the *Southern Cross* results in the *Geographical Journal* for last June. These data have been reprinted in the *Quarterly Journal of the Royal Meteorological Society* (London) for October, 1900 (292–296). Fricker's *The Antarctic Regions*, recently published (New York, The Macmillan Co.), includes a chapter on climate. The valuable meteorological results obtained on the recent expeditions of the *Southern Cross* and of the *Belgica* may be said to have increased the appetite of meteorologists for the still more extended contributions to Antarctic meteorology which may be expected from the coming English and German expeditions.

The Argentine and Indian Wheat Crops.—The November number of the *Bulletin of the Bureau of American Republics* calls attention to some interesting facts in connection with the climatic

control of the time of harvest in Argentina and in India, and the relation between the time of the harvest and the price of the wheat. The harvests of the Argentine Republic and of India take place during what is known in other wheat-growing sections of the world as the "dead season." In the former country, the harvest usually begins late in November in the northern latitudes, and progresses southward until early in February. In India, on the other hand, the harvest commences late in February in the south and progresses northward until early in May. The shipments of wheat from these two countries consequently come to the world's markets at a time when the stock on hand has been considerably depleted, and, therefore, these late supplies have a ruling effect on prices.

THE HARVARD METEOROLOGICAL STATIONS IN PERU.—In this *Bulletin*, Vol. XXXI., pp. 368–369, mention was made of the valuable pioneer work in meteorology which has been carried on by the Harvard College Observatory in connection with its Southern Station at Arequipa, Peru. Professor Pickering's Annual Report as Director of the Harvard College Observatory contains the unwelcome announcement that the meteorological observations at all the stations except Arequipa were discontinued on Jan. 1, 1901. This means the abandonment of the highest meteorological station in the world, on El Misti (19,200 feet), as well as of the interesting station at the old Inca capital, Cuzco, and of those at Mollendo (100 feet), La Joya (4,150 feet), Alto de los Huesos (13,300 feet), Misti Base (15,600 feet), Vincocaya (14,600 feet), and Puno (12,500 feet). The reasons which have induced Professor Pickering to discontinue these stations are excellent; but meteorologists will nevertheless receive with regret the announcement that this step has been taken. Professor Pickering points out that observations of great accuracy cannot be expected where the observers are necessarily men of limited education and experience. To maintain trained observers at all these stations would mean a greatly increased expense. In the region in which these observations have been taken the uniformity of meteorological conditions from year to year is so striking that but little would probably be gained by continuing routine observations during a long series of years. Although the step which has been taken is to be regretted, meteorologists are under the greatest obligations to the Harvard College Observatory for the splendid contribution it has already made to the climatology of Peru.

PROPERTY LOSS BY LIGHTNING IN THE UNITED STATES IN 1899.—Professor A. J. Henry, of the United States Weather Bureau, considers the property loss by lightning in the United States during 1899 in the *Monthly Weather Review* for October last. The total number of reports received of buildings struck and damaged or destroyed by lightning was 5,527, or about three times as many as were received during the year 1898. In addition to the above, 729 buildings caught fire, as a result of exposure to other buildings that had been set on fire by lightning. The approximate loss in the 2,825 known cases was $3,016,520, or an average loss of nearly $1,100 per building. The number of insured buildings struck by lightning in the United States in 1899, according to the Chronicle Fire Tables, was 2,760, with an average loss of over $1,400 per building. The great majority of buildings struck were not provided with lightning rods, as was the case in 1898; but 70 buildings provided with rods were also struck and damaged. Professor Henry concludes that a conservative estimate of the total loss of property by lightning during the year would probably be $6,000,000.

RAINFALL AND ALTITUDE IN ENGLAND.—The Assistant Secretary of the Royal Meteorological Society, William Marriott, contributes a paper on the *Rainfall in the West and East of England in Relation to Altitude above Sea-Level* to the *Quarterly Journal of the Royal Meteorological Society* for October. The mean monthly and mean annual rainfalls at the English and Welsh stations were obtained for the ten-year period 1881–90, and the stations were grouped according to their altitude above sea-level. The annual rainfall being decidedly heavier in the western portion of the country than in the eastern portion, it seemed desirable to separate the western from the eastern stations. Those stations were classed as "western" which drain to the west, and those which drain to the east were classed as "eastern." The stations were then grouped together for each 50 feet up to 500 feet, and above that altitude for each 100 feet. The results show that there is a general increase in the amount of rainfall as the altitude increases. There are some irregularities at the higher altitudes, but these, Mr. Marriott thinks, are undoubtedly due to the small number of stations employed. The values when plotted show in a very striking manner that the rainfall is considerably greater in the west than in the east, the excess being nearly a quarter. When, however, the west and east values are combined, the curve becomes much smoother, the increase of rainfall according to altitude being much more uniform.

The graphic results show, further, that the monthly rainfall in the west is subject to a much greater range than in the east; and that in the west the maximum at all altitudes occurs in November (and not in January, as is popularly supposed), but in the east generally in October. One of the most marked features in all the diagrams, both west and east, is the great rise in the rainfall from June to July. The increase of rainfall with altitude is thus summarized by Mr. Marriott:

100 feet	+ 9	per cent.	600 feet	+ 5	per cent.
200 "	+ 3	"	700 "	+ 38	"
300 "	+ 3	"	800 "	+ 3	"
400 "	+ 14	"	900 "	+ 4	"
500 "	+ 1	"	1,000 "	− 21	"

Altitude as a Solution of the Acclimatisation Problem.—Once again comes the suggestion or implication—this time from Hon. Charles Denby (*Independent*, New York, December)—that the problem of the acclimatisation of the white race in the tropics can be solved by establishing residences and sanitaria at a few thousand feet above sea-level. Mr. Denby refers to the plateau of Benguet, in the northwestern part of the island of Luzon, which averages about 4,000 feet above sea-level, and up to which the Government proposes to build a railway. The existence of this province, in the opinion of Mr. Denby, will solve many of the questions which have arisen out of our possession of the Philippines, because it will furnish a fine sanitarium and a healthy location for the seat of government. While mountain and plateau stations make living in many parts of the tropics possible for the white man, for the reason that, with increasing altitude above sea-level, there is a general decrease of temperature and of humidity, yet one of the chief characteristics of tropical climates —viz., the monotony—remains as marked a feature aloft as at sea-level. It is the monotony of the climatic conditions in the tropics which is one of the difficulties with which a Northerner has to contend. The constant repetition, from day to day and from season to season (for the seasonal changes are, as a whole, very slight in the tropics), of the same conditions has a deadening, enervating effect, which cannot be counteracted by seeking a residence at a higher altitude. The spur of the seasons, which is so important an influence in giving the northern peoples their vigor and energy and "push," is lacking in the tropics. No mountain climate can supply this missing quality. Mountain stations are very important, because they do furnish some relief from

the excessive heat and humidity of the lowlands, and are above the zone of many tropical diseases; but they do not solve the problem of acclimatisation. The northern winter—disagreeable as it often is—has contributed much toward making our northern races what they are. Let us recognise clearly that tropical mountain stations are all-important in making life more bearable in the tropics, and in keeping white men and women free from many diseases that are prevalent in the lowlands; but let us also beware of overrating the value of these same high-level stations.

GEOGRAPHICAL RECORD.

AMERICA.

Population of the Klondike.—The census taken in May, last year, in the Klondike mining field showed 16,395 persons, of whom 14,834 were white men, 1,195 white women, and 366 Indians. The population included 9,534 Americans, 4,555 British subjects, of whom 3,000 were Canadians; 155 Germans, 146 Swedes, 107 Norwegians, and 101 French.

Irrigation in Colorado.—The *Monthly Weather Review* for November says that agriculture by irrigation has reached a degree of development in Colorado unrivalled elsewhere in the arid regions. There is no prospect, however, of its further extension under present circumstances. The amount of water now reaching the streams is smaller than a quarter of a century ago. Scarcity is common, and droughty conditions during the summer often cause great loss. Deforestation and forest fires have removed large tracts of timber, nature's reservoirs in the mountains, so that the amount of moisture conserved till midsummer is growing less under the unobstructed influence of the sun and winds.

EUROPE.

Growth of German Cities.—The census of Germany is now taken every five years. The enumeration on December 1 last revealed remarkable growth of German cities since 1895. The transference of population from the country to the cities made more rapid progress in the past five years than at any earlier period. The population of Berlin is 1,884,345, a gain of 12.3 per cent. in five years. Nuremberg has made the most rapid increase. Situated at the convergence of several valleys, it is the meeting-place of seven large railroads, and one of the largest receiving and shipping points in South Germany. Its increase in population was over 60 per cent., or 90,357 in a total population of 260,743. The city of Posen is a striking illustration of the growth of manufacturing and the decline of agriculture. The province of Posen has grown very little in population for years, as the young farmers have flocked to the cities of Prussia to find employment in the factories; but while the province, as a whole, has languished, the city of Posen has grown more rapidly than any other, except

Nuremberg. Its population is 116,151, an increase over 1895 of 58.6 per cent. The population of Stettin is 209,988, an increase of 49.2 per cent.; of Mannheim, 140,384, an increase of 43.6 per cent.; Hamburg has 704,069 population, increase 79,117; Munich, 498,503, increase 87,502; Leipzig, 455,120, increase 55,126; Breslau, 422,415, increase 49,246; Dresden, 305,349, increase 58,909; Cologne, 376,085, increase 49,121; Frankfort-on-the-Main, 287,813, increase 58,534; Chemnitz, 206,584, increase 45,567; and Halle, 156,503, increase 43,027. Seventy years ago about four-fifths of the population living in the states that now compose the German Empire were engaged in agriculture. For fifteen years, however, the transformation of Germany from an agricultural to an industrial nation has made steady progress.

CANALS IN HUNGARY.—The plans for the new canals, projected by the Hungarian Government, have been submitted to the House of Deputies, which is expected to vote the money required to build them. One of them is to connect the Theiss and Danube rivers, saving about 400 miles of navigation and giving the upper Theiss valley a short water route to Budapest. The Schamatzer canal, which is to be dug between the Danube and the Save, will shorten the water route from the upper Save to Budapest about 250 miles. The third project is to connect the Waag and Oder systems, thus giving a water connection between Germany and Hungary.

AFRICA.

STEAMERS ON THE UPPER CONGO.—The first steamer was launched at Stanley Pool, on the Upper Congo, twenty years ago. There are now 103 steamboats plying on the Upper Congo and its tributaries, or preparing in the shipyards at Stanley Pool for launching. According to *Le Mouvement Géographique*, Belgian enterprise has placed nearly half of these vessels on the river—the fleet of the Congo Free State numbering twenty-nine, and that of the Belgium trading companies nineteen steamers. In the past two years the French have sent thirty-nine boats to Brazzaville, on Stanley Pool, and most of them have been launched. The Dutch traders own ten vessels, the Germans two, and English and American missionary societies have four steamers in their service. Within the past two years half of the Upper Congo fleet has been carried on the cars to Stanley Pool. A month was formerly required to transport a steamboat, carried in sections on the backs of porters, around the rapids in the Lower Congo; but a steamboat is now carried over

the route in two days. Thus both railroad and steam vessels are working together in the commercial expansion of the country.

MAIL SERVICE BETWEEN THE BAHR-EL-GHAZAL AND EUROPE.—Postal communications have been opened between Europe and the Bahr-el-Ghazal, in the southern part of the Nile basin. Mails from the Belgian post at Lado, on the Upper Nile, have arrived in Belgium in twenty-nine days. An English gunboat is plying regularly between the Bahr-el-Ghazal, Fashoda, and Khartum, where it connects with the railroad to Cairo. Thus regular steam communications have been established between equatorial Central Africa and Europe (*Revue Française de l'étranger et des Colonies*, Oct., 1900).

DWARFS IN THE CONGO FORESTS.—The *Geographical Journal* (Jan., 1901) says that Sir Harry Johnston, in July last, crossed the Semliki river and entered the Congo Free State to transact some business with the Free State officials. He improved the opportunity to restore to their homes in the Congo forest a number of dwarfs who had been kidnapped by a German for the purpose of sending them to the Paris Exposition. He made many photographs of the dwarfs he met in the forest, and of their implements and dwellings. They were of two types—black skinned, with a good deal of stiff, curling black hair about the body; and red, or yellow skin, with a tendency to redness in the hair of the head. The explorer believes these dwarfs no longer speak an original language, but talk, in a slightly corrupted form, the language of the taller negroes near whom they live. In speaking the languages of surrounding tribes the dwarfs introduce into their pronunciation "hiatuses," which bear a strong resemblance to the clicks of the Bushman and Hottentot. They also speak in a curious and very marked sing-song. Their intelligence is well developed, and, though ugly in features and often apelike in appearance, they are usually of winning and cheerful disposition. Their dances are so frolicsome and gay and so full of pretty movements as to distinguish them, in this respect, from the average negro.

ASIA.

THE QUESTION OF LOB-NOR.—When Dr. Sven Hedin reached a telegraph office, late last year, he sent this message to Sweden: "The Lob-nor question is solved." The details of his investigation in this part of Chinese Turkistan have recently reached Sweden in a long letter from the explorer. Lake Lob is shown on old Chinese maps as a large salt lake among the sand-wastes north of the giant

Altyn-Tagh range. The lake receives the waters of the long Tarim river, and some other streams. The Russian explorer, Prjevalsky, reaching Lob-nor in 1876, found it considerably south of the position assigned to it by the Chinese, and attributed the fact to the inaccuracy of the Chinese maps. After Dr. Hedin visited the lake, in 1896, he published in *Petermanns Mitteilungen* a series of nine maps, showing that the Chinese had assigned different positions to the lake at various times, these positions lying approximately north or south of one another. He advanced the theory that the lake is not stationary, but within the past few centuries has moved about forty miles to the south, and is now moving north again. This theory was discredited by Russian geographers, who accepted Prjevalsky's view that the Chinese charts were untrustworthy. On his visit to the lake last year Dr. Hedin discovered, to the north of the present lake, the bed of the lake as it is marked on the Chinese maps of the eighteenth century. He was twelve hours in crossing this old bed, which consists of horizontal layers of mud-banks, in which there are millions of shells of salt-water mussels, showing that this sterile ground once teemed with life. Hedin's explanation of the migration of the lake is that which he advanced after his first visit. He says that the region where the waters accumulate is now practically on a dead level, and it requires only the formation of mud-flats or sand-dunes, a little above the general level, to change the position of the main water receptacle.

AUSTRALIA.

The Commonwealth of Australia.—The Australian colonies on January 1 last became States in the Commonwealth of Australia. The nation thus formed shares with the United States a distinction that until now has been held by this country alone. Australia's resources are so large and varied that it may reasonably expect in time to become, in most material things, a self-sufficing nation. Owing to its vast extent, Australia embraces every variety of climate, except that found within the Polar circle. It can grow most of the vegetable and animal products of the temperate, subtropical, and tropical regions. It is given only to two nations—the United States and the Commonwealth of Australia—to be able to produce nearly all the commodities they need.

NOTES ON COMMERCIAL GEOGRAPHY.

France's wine crop in 1900 was the fourth largest crop ever produced in that country. The amount was 1,721,000,000 gallons.

It would have been larger if the heavy rains of September had not destroyed the grapes on many thousands of acres. Periodicals devoted to the interests of the wine-growers are advising that attention now be paid to quality, and not to the quantity. Consul Covert writes from Lyons that there are reasons to believe that the acreage planted in vines will not be increased.

The statistics just published by the Merchants' Union Silk Syndicate of Lyons, France, show an increase of about 4,000,000 pounds of raw silk a year in the three years ending in 1899, and a total production of 38,300,000 pounds in 1899. These figures, however, include only the export product of China, Japan, and Persia. These countries retain enormous quantities of raw silk for home manufacture, and the total product for the year 1899 is estimated at 60,000,000 pounds.

In 1897 artificial indigo was brought upon the market at a price that enabled it to compete with the indigo raised in the Bengal province of Behar, the chief region of indigo culture. Dr. Brunck, in a recent lecture in Berlin, said that the growth of the manufacture of artificial indigo in Germany has been so enormous that 250,000 acres of land in India are required to produce as much indigo as is now manufactured annually from coal-tar by one company in Baden. The artificial supply seems likely to drive the natural product from the market. In the effort to avert the destruction of the Behar indigo industry the British Government has recently ordered that all the blue cloth supplied to the army and navy must be dyed in natural indigo.

The free-trade policy that Russia has long maintained in Siberia came to an end in January. The heavy duties levied in European Russia will be imposed at the Siberian frontiers and ports. A short free list, however, will include cereals, as eastern Siberia does not raise all the grain needed. Agricultural machinery will also be free. The free-trade policy has been abandoned because Russia believes that, with the completion of steam communications overland to Vladivostok, Russia may herself supply the needs of eastern Siberia, to the exclusion of foreign commodities.

POLAR REGIONS.

The Swedish party, led by Mr. Gustav Kolthoff, report the results of their voyage last summer for the study of the Arctic fauna.

They left Norway on the 4th of June, and made their first stop at Spitzbergen.

They explored Prince Charles Island, and then steamed along the edge of the impenetrable Polar ice towards the coast of East Greenland as far south as the island of Jan Mayen, reaching Greenland on the 31st of July, at Mackenzie Bay. The ground was bare of snow, and vegetation was vigorous.

August 14 the vessel entered Franz Josef Fjord, which was free of ice, and there the party remained for ten days, making collections, and capturing alive two young musk oxen, which have been safely landed in Sweden.

The eastern coast of Greenland, which is ordinarily blocked by ice, was found to be almost free during the past season.

PHYSIOGRAPHIC NOTES.

BY

RALPH S. TARR.

Glaciation in Alaska.—Thanks to the discovery of gold in Alaska, we are now learning a great deal concerning the geology and physical geography of that far-distant territory. For example, Part VII of the Twentieth Annual Report of the United States Geological Survey, a volume of over 500 pages, is devoted to reports of explorations in Alaska by Messrs. Eldridge, Spurr, Mendenhall, Schrader, and Brooks. While in some parts there seems to be need of editing, for the elimination of interesting but decidedly unimportant narration of experiences, there is a great amount of important material in each of these reports. They are, moreover, finely illustrated with excellent half-tones and maps, giving one many clear pictures of conditions in the parts of Alaska visited. Being in the nature of reconnaissance reports, much of the material is in a form of narration that would be difficult to summarize. Many points of physiography are brought forward, but perhaps the portions of most general interest are those relating to the evidences of past glaciation.

For example, Spurr's report upon Southwestern Alaska, including much of the Yukon valley, and reaching eastward to Cook Inlet, contains a rather full statement of the evidences of glaciation. The mountains were formed during the Tertiary revolution, then very decidedly lowered so as to admit the sea far inland and up to levels of fully 3,000 feet above the present shore-line. The evidence of this is found in the presence of rock-cut terraces and extensive deposits of Pleistocene gravels, which rest unconformably on the underlying folded mountain rocks. That the elevation to the present level was slow and intermittent is indicated by successive terrace-levels lower than the upper one. The evidence seems conclusive that these Pleistocene gravels are marine, and that at the time of their formation glaciers existed in the mountains, discharging icebergs into the sea.

With regard to former glaciation, Spurr says:

> There has been no general glaciation of southwestern Alaska, and if what glaciation there was constituted the Glacial period, then Alaska is still in it. For the evidence of ice action, shown in the deposits, the writer, as before stated, is inclined to look very largely to shore ice and to river ice, for these are undoubtedly very powerful eroding and transporting agents.

That there has been no general glaciation is indicated by the fact that, side by side with valleys containing glaciers, and in which they were formerly only slightly more extensive than now, are other valleys containing convincing evidence of never having been glaciated. Only valleys that are broad and U-shaped and that contain well-defined cirques are at present occupied by glaciers. In front of the existing glaciers are the sea-formed gravel deposits, mentioned above, which include boulders dropped by bergs. The glaciers did not reach below the ancient shore-line, apparently breaking off and forming icebergs, and thus ending in the sea. Since that time the advance of glaciers has been only slightly greater than at present, so that, from the beginning of the Pleistocene to the present time, the glaciers, according to Spurr, have been of about the same extent as those now existing there.

It is to be noted, however, that this does not preclude the possibility of a former very decided difference in climate; for the evidence seems to point toward a much lower stand of the land in this region when glaciation involved the more eastern parts of the continent. It would seem, then, that the uplift of the land was coincident with the change from the glacial climate to that of the present, so that there was at no time a condition of both climate and land elevation favoring general glaciation.

Mendenhall, on the other hand, whose territory includes a quadrangle to the east of Cook Inlet, comes to a rather different conclusion, as is indicated by the following quotation:

> Throughout the entire region studied the explorer is constantly confronted with evidence to prove that the present glaciers are but remnants of a system of vastly greater extent. Glacial scratches, polished surfaces, erratic boulders, typically glacial topographic features, nearly all of the usual forms of evidence, are abundant. It is difficult to decide just how extensive the older system was, but the conclusion reached is that a general ice-cap has not at any time buried this part of the continent, but rather that the greatest advance, of which records remain, was an expansion of the present system, essentially alpine, with its centres of accumulation, as now, in the two great ranges—the one along the coast, the other in the interior—and that from these centres ice streams flowed down the valleys, and spreading, fan-shaped sheets, of the type which Professor Russell has called Piedmont glaciers, rode out over the adjacent lowlands.

Such differences in deduction from observation bring up the interesting question as to whether the facts are actually different on the southern coast from those in the Yukon valley, or whether the difference in conclusion is the result of the interpretation which the observer places upon the facts. For example, is the evidence of glaciation in the Yukon valley buried beneath the gravel de-

posits? Or, on the other hand, are some of Mendenhall's evidences of former glaciation to be ascribed to the action of floating ice?

Schrader's report, which is based upon observations in the Copper River valley, also describes sea-deposited gravels of recent origin, and unconsolidated, reaching to elevations of 2,800 or 2,900 feet. His conclusion is that glacial activity was formerly much greater than at present. Brooks' reconnaissance included the Tanana river and a portion of the White river, upper tributaries of the Yukon. He finds no evidence of general glaciation in the Yukon, such as that noted by Dawson, McConnell, Russell and Hayes, although glacial deposits are found associated with the gravels which occur in his territory as in that of the others. A glacier once occupied the White River valley; but the glaciers of the Tanana valley and its tributaries appear to be of the Piedmont type, like that of the present Malaspina glacier in the Mount St. Elias region. He concludes that glaciers formed "a comparatively unimportant part in the physiographic development of the region," but that they did contribute silts and gravels, and also helped to bring about some drainage modifications.

From these various reports it seems difficult, as yet, to arrive at a definite conclusion concerning glaciation in Alaska, although the evidence as a whole seems to support the belief that, while glaciation did not extend over the entire territory, there were many glaciers, in some portions at least, which were decidedly larger than at present, broadening on the lowlands to the Piedmont condition. The results of further more detailed work will be awaited with interest.

These Alaskan reports contain many facts and suggestions concerning other features of physiographic nature. For example, Brooks describes the even sky-line which the mountain crests reach; and this, he concludes, indicates decisively the former existence of a peneplain whose exact age is doubtful, though somewhere in the Tertiary time, during a long period of stability of land. Rock benches found on valley sides are interpreted as the river bottoms of former time. His interpretation of the topography of this mountainous region, whose irregularities are accounted for by warping and by monadnocks, would be much more convincing if it had been accompanied by a consideration of the alternate hypothesis of the lowering of the mountain crests to a measure of sub-equality. The acceptance of a peneplain explanation for so rugged a region should require the most convincing evidence.

Glaciation in Siberia.—Another region that has been little studied in the past, and the question of whose glaciation is of great interest, is that of Siberia. The evidence from that vast area has been somewhat conflicting, and it is therefore of interest to record the note upon the subject which Purington has published in the *American Geologist* for January, 1901 (XXVIII, 45–47). Purington has spent three seasons in Siberia, during which time he has been on the outlook for evidence of glaciation. He finds that the lakes are not due to glaciation, but are merely remnants of former larger lakes. Deceptive imitations of evidences of glaciation frequently led him for the moment to consider that he had found signs of former glacial action; but upon study these were soon proved to be mere imitations. As a result of three years of travel, he records the fact that but one genuine instance of a fair-sized area of glaciation was found—namely, in the Yenisei valley, about fifteen miles southeast of Krasnoyarsk, in southern-central Siberia. There an area of about a hundred square miles, enclosed by a high granite wall and sedimentary rocks, contained abundant signs of local glaciation, among them drumlins, well-developed cirque topography, and a sand plain, but no scratched pebbles. Evidences of glaciation were found among the Altai mountains, where glaciers still exist; but the gold gravels of eastern Siberia, which by some have been ascribed to glacial action, were found to be not due to that cause.

These observations of Purington give support to the belief that general glaciation did not exist in Siberia, not so much because of the absence of a glacial climate as to the lack of high gathering grounds for the ice, together with the distance from the sea, which would prohibit extensive precipitation. That the climatic conditions were otherwise favorable for glaciation is suggested by the former extension of glaciers among the high mountains of central Asia, and also by this area of local glaciation, where the area of high land favored the gathering of snow.

Origin of Yosemite Valley.—Turner (*Proc. Cal. Acad. Sci., 3rd Ser., Vol. I, 261–321*), after sketching the history of the Sierra Nevada, in the vicinity of the Yosemite, takes up the discussion of the Yosemite Valley. He finds some evidence, though not absolutely conclusive, of two glacial periods. In considering the origin of this remarkable valley he discusses the various theories, but finds himself neither able to accept the Muir explanation, of glacial erosion, nor the Whitney explanation, of origin through block-

faulting. His conclusion is that it is not unlike other cañons, the world over, in being due primarily to *stream* erosion, aided, in this case, by the influence of the marked joints of the rock. According to Turner, cañons cut in the inter-glacial epoch were modified by the ice advance of the second glacial epoch.

In review of Turner's paper, Gannett (*Nat. Geog. Mag.*, *XII*, *1901*, *86–87*) vigorously asserts glacial origin, pointing out that there is an abundance of evidence of marked glacial action in this part of the Sierra Nevada, in the form of bare, rounded granite surfaces, U-shaped cañons, thousands of lake basins, and many cirques and hanging valleys. That this glaciation was long continued, and effective in its work, Gannett states, can be seen at a glance; and, moreover, that the line of demarcation between the channel and glacial erosion is clearly marked. Hanging valleys occur on the margins of the Yosemite Valley, and the Merced Valley changes abruptly to a V-shaped gorge at the foot of the Yosemite Valley. Gannett's conclusion, quite in contrast to that of Turner, is that the Yosemite is an ordinary and necessary product of *glacial* erosion.

ISLANDS OFF THE COAST OF SOUTHERN CALIFORNIA.—Partly through a study in the field, and partly from a study based upon the excellent United States Coast Survey maps of these islands, W. S. Tangier Smith (*Bull. Dept. Geol. Univ. of California*, *II*, *1900*, *179–230*) discusses the origin of the peculiar topographical features of the several islands lying off the California coast. Throughout this region there was land depression during the Miocene, followed by a period of erosion, during which the land was more elevated than now. A marked unconformity between the Miocene and Pliocene is proof of this erosion period. During the succeeding Pliocene depression the Miocene valleys were filled more or less, though much of this filling has since been removed.

During the post-Pliocene time some of the islands were mountain masses forming part of the mainland. Later folding, some occurring in the Pliocene, affected the whole region and formed some of the islands, as, for example, San Clemente. These mountain-building forces have acted intermittently down to the very present, and have included both faulting and folding; but the later movements have been of minor consequence in comparison to the earlier. In consequence of the movements, which at times have approached the condition of oscillation, there were local differential uplifts and downsinkings, as, for example, that which formed the San Francisco

Bay. During the Pliocene depression the land stood fully 1,500 feet below the present level, and this stand was long enough to permit the waves to cut off the tops of some of the islands. The post-Pliocene uplift, perhaps, connected the northern islands with the mainland; but the evidence indicates that the southern islands were not so connected. A slight, recent depression is shown by drowned valleys.

The paper is partly devoted to a discussion of the physiographic features of the sea-formed terraces, drowned valleys, and the stage of stream development. Smith states that a future more detailed study of the geology—which he believes is needed—may modify some of the details; but that the main object of his paper is to bring forward evidence that the latest general land movements on the islands have been the same as those on the neighboring mainland.

CERROS, OR CEDROS ISLAND.

A NOTE BY GUSTAV EISEN, PH.D.

The comparatively large island situated on the west coast of Baja California, Mexico, at the intersection of W. Long. 115° and Lat. 28°, is variously known as Cerros and Cedros. On the U. S. Government charts the island is always marked "Cerros." This is also the case on most English and French maps. Mexican and some American navigators call the island "Cedros," though the former name is not entirely unknown on account of the American charts, which are the ones generally in use. The first person to call my attention to the existence of the two names was Captain John von Helms, one of the most well-known seafaring men on the whole Pacific coast, than whom no one is better acquainted with the nomenclature of the coast of Baja California. I was at that moment engaged in constructing two maps of Baja California to accompany my biological reports on that peninsula. The local map referred exclusively to the Cape region, or southern extremity of the peninsula, while the other was a general map of the whole country. Captain von Helms stated that the name Cerros was almost unknown, or at least not in use, and that it had probably originated from misspelling or from ignorance of the chart-makers. Such errors in misspelling are common on all charts relating to Mexico. It would be easy to substitute an *r* for a *d*, and this would account for the change in name. As will be seen, however, the U. S. Government map-makers were this time not at fault, for the name Cerros is older than the United States. Having no opportunity to investigate the matter at the time, I accepted Capt. Von Helms' verdict and placed the name Cedros on the new map (published by the California Academy of Sciences of San Francisco, 1895). Captain Von Helms argued, moreover, that the name Cerros, meaning "hills," and all the islands on the coast being hilly, there was no sense in calling any one island by that name. The existence of cedars on the island seemed to justify the name Cedros. Last year I had occasion to construct a new map (published recently by the American Geographical Society), and on this map I was induced by the Mexican Government Surveyor at Ensenada to retain the name Cerros and discard Cedros. The Surveyor declared that there were no cedars on the island. He had been there several times and had found pines, but no cedars. The island, he said, was unusually hilly, and the name Cerros would be quite appropriate. I restored the name suggested by him and recorded the island as Cerros. I thought, however, it would be of some little interest to investigate the matter. My first inquiry was from the people living on the coast of Baja California, and from them I learned that the island was generally known as Cedros and that the name Cerros was never used, though it was known on account of the foreign maps. This alone would justify the dropping of the name Cerros. Having since studied the historical side of the question, I have thought that others might be interested in knowing the conclusions to which I have come.

The island of Cedros (for this is its real name) was first seen by the Spanish navigator, Francisco de Ulloa, who landed on the island January 15th, 1539. Ulloa says of his visit to the island: "They (the hills) were high and on the top of each were many tall, slender trees. The island was twenty leagues in circuit, and was afterwards named 'Isla de Los Cedros.'" From Ulloa's account we also learn that the island was densely inhabited by Indians, with whom Ulloa and his sailors came in conflict, his dog Berecillo, for instance, being badly beaten by the savages. These

latter used canoes made of trunks of cedar trees. The trunks were not hollowed out, but were simply lashed together like rafts. There were groves of cedars on the north side of the island, and the name was given on account of them. From Ulloa's relation, it is evident that the priority belongs to the name Cedros, the one now most in use. While this may be considered as settled once for all, not a little interest is attached to the history of the name Cerros.

After Ulloa the island was visited by Sebastian Viscaino, who landed there August 31, 1602. Viscaino refers to the island as Isla de Cerros. This is unaccountable, as several maps already published gave the name Cedros Island; notably so the Forlani map, published 1574. On this map we read plainly: "Y. de Cedri." On the globe of Molineaux of 1592 we find the island indicated by the same name, etc. We must suppose that Viscaino either had no previous knowledge of these charts, and that he had not carefully read the account of Ulloa, or that his scribe made an error in writing and substituted *r* for *d*. It may be, however, that Viscaino actually changed the name and thought that "Cerros" would be more appropriate. The following table gives some of the various names of this island from early times to the present day:

1539. Francisco Ulloa, discoverer: "Isla de Cedros."

1574. Forlani map: "Y. de Cedri."

1589. Map of Abr. Ortelius: "Islas de los Cedros."

1592. Globe of Molineaux: "I. de Cedri."

1594. Map of Petrus Plancius: "I. de Cedros."

1602. Sebastian Viscaino, landed on the island: "Isla de Cerros."

1625. Henry Briggs map: "I. de la Carre."

1628. Gerhard Mercator (Atlas Minor): "I. de los Cedros." Marked too far north.

1700. Guillaume Delisle: "I. Des Cedres."

1720. Stockholm chart: "I. de Ceros."

1722. Guillaume Delisle map: "I. de Cedros."

1732. Sigismund Taraval, who landed on the island, found that the natives called the island "Amalgua," meaning the island of fogs.

1743. Map of Capt. Anson: "Isla de Peros."

1900. U. S. Government charts: "Cerros Island."

1900. Native name by Mexicans in the vicinity of the Island: "Isla de Cedros."

This list calls for a few remarks. The name on the map of Briggs, "I. de la Carre," is undoubtedly taken from the form of the island, as seen from the south. "Carre" is in French the word for a tall, pointed hat of the style used by the Mexicans, and the island, with its high southern peak, has an undoubted resemblance to such a hat. Delisle, who introduced so many improvements and made so many corrections in the maps of his time, also restored the original name to the island. The names "Ceros" and "Peros" on the other charts are probably due to error in writing. The chart of Capt. Anson is full of similar or worse errors in spelling, as, for instance, "Maria Hermosos" instead of "Morro Hermoso." "Morro," meaning a rounded prominent cape, is one of the most common geographical words in Spanish-speaking countries. The United States Government surveyors probably copied the name from older charts, and had little opportunity to make inquiry among the natives on the Pacific coast of the peninsula. The same may be said of the British surveyors. On French maps the island is generally called "Cerros." Now we come to the question whether the name "Cedros" is justified or not. The northern point, as well as a large part of the high backbone of the island, is sparsely covered with coniferous trees. The largest

of these is a species of pine—*pinus muricata.* It is everywhere a rather small tree, but sometimes sufficiently large to be used for canoes; and we are told that the Indian canoes were made of whole trunks tied together and not hollowed out. There is an abundance of real cedar growing on the northern part of the island, though the trees are very small, and might even be designated bushes. This tree is known as *Juniperus Californica*, and was called by Kellogg *Juniperus Cerrosianus.* Even in New England junipers are often known as cedars. Whether Ulloa actually mistook the large pines for cedars or had branches brought him by his men, who climbed the hills, is not known. The fact remains that cedars are actually found on the island, and that thus the name is not misapplied. In the mountains of Alta California this juniper often grows to a large size, and might be turned into a hollowed-out canoe. In Ulloa's time some of the junipers on Cedros Island may have been larger than now. The island has been little explored, and it is probable, or at least possible, that even at present there are favored nooks where larger junipers are found.

To sum up, I think that we are fully justified in retaining for this island the name of Cedros and in dropping the name Cerros. The reasons for this are as follows:

1. The discoverer of the island, Francisco de Ulloa, gave the name "Isla de Cedros."

2. Cedars are actually found on the island.

3. The island is at present known to the vast majority of Mexicans as "Isla de Cedros."

4. Many of the captains plying between San Francisco and the southern ports recognize the error on the United States Government charts and designate the island as "Cedros Island."

In addition to the above, I may state that, according to Mr. T. S. Brandegee, the well-known botanist and explorer of Baja California, the cedar so extensively exported from "Tres Marias Islands," south of the peninsula, does not belong to the coniferous trees, but to a different family—the Meliaceæ, the genus name being *Cedrela.* This only shows that the Mexicans apply the name cedros to widely separated genera. The cedrela is not found on Cedros Island.

THE COOSA RIVER.

BY

FREDERICK G. BROMBERG.

In the early days of the Republic, before the invention of railroads, public attention was directed to the waterways of this country, both internal and along the sea-coast lines, as means of communication and ways for commerce between the widely separated territories composing the United States.

It was then, in the twenties, that surveys were made for an interior water route along the coasts of the Atlantic Ocean and the Gulf of Mexico, including one for a canal across the peninsula of Florida, as a part of that proposed system. It was then that the Coosa River occupied a prominent place in all water-way schemes, and was a well-known feature of American geography.

Prior to 1823, the Legislature of Alabama passed a bill to improve the navigation of the Coosa River and to aid in its connection with the Tennessee waters. In 1824, this act was formally approved by Congress. In 1828, Congress provided that any surplus of the grant for improving the Tennessee River should be applied to the improvement of the Coosa, Cahawba and Black Warrior Rivers.

The original project for the improvement of the Coosa River contemplated the opening of a continuous water route of transportation from the Mississippi River to the Atlantic Ocean, by way of the Ohio, Tennessee, Coosa, Etowah, Ocmulgee and Altamaha Rivers, with canals from the Tennessee to the Coosa, and from the Etowah to the Ocmulgee. This was designated as the Southern route.—(*Memorial Coosa River Imp. Com., Sept. 27, 1899, p. 5.*)

In proportion as railways developed into large systems, binding together the distant parts of the country by roads capable of rapid transportation, these water-way projects dropped out of mind, and the Coosa River seems to have been so far forgotten that recently in the State of Massachusetts a Superintendent of Education, upon being requested by the Congressman of his district to introduce into the papers for a competitive examination for an appointment to the U. S. Military Academy at West Point questions relating to the Coosa River, replied by asking the Congressman, "Where is the Coosa River?" Judging from what we saw on a recent trip down the river from Rome, Georgia, to Lock No. 4, 35 to 40 miles below Greensport, the river has been forgotten in Alabama and Georgia as well as in Massachusetts.

It is unfortunate for both the Alabama and the Coosa Rivers that

they ever had distinctive names. They are in fact one and the same river, and it is impossible to see any physical demarcation at the point where the change of name occurs. Had the name Alabama been given to the joint rivers, throughout their continuous length, there would have been one noble water-way of 863 miles, from Tennessee to Mobile, at its mouth, which now is apparently broken up into three disjointed pieces, known as the Oostanaula for 108 miles above Rome to the southern edge of the State of Tennessee; as the Coosa River for 315 miles, from Rome, in Georgia, to Wetumpka, in Alabama; as the Alabama River from Wetumpka to the mouth of the Tombigbee River, 390 miles, and as the Mobile River from the latter point, 50 miles to the Bay of Mobile.—(*Mem.*, *Sept. 27*, *1899*, *p. 4.*)

There is but one serious obstacle to the unity of this great river, namely, a series of rapids about midway of its length, stretching over about 142 miles, along which the river falls about 400 feet, or three times as much as the fall of the Niagara River. It is this obstruction which it is proposed to overcome by 36 locks, 3 of which have been completed at the upper end, and one nearly completed at the lower end, whilst a fourth at the upper end was begun several years ago, but work upon it stopped for want of appropriations by Congress, and is now a picture of ruin and decay, and a striking object-lesson of the folly of spasmodic appropriations as a means for executing a great plan of internal improvements. Let us hope that the recent visit of the Rivers and Harbors Committee of the House of Representatives to the locks will result in wiser and more scientific methods.

Whilst it is true that all four rivers—the Mobile, Alabama, Coosa and Oostanaula—form one, yet each has its own distinctive territory, different from the others, and my duty is more particularly to set forth those of the part known distinctively as the Coosa River.

The Coosa Valley, in Alabama, is nearly 10,000 square miles in area, of which about one-half is of coal measures.—(*Geol. Surv. Ala.*, *1897*. *Report on Valley Reg.*, *Part 2*, *The Coosa Valley*, *p. 1.*)

MINERAL RESOURCES.—

The mineral resources of this region are great and varied. It, with the metamorphic belt to the southeast, might, with a good deal of propriety, be called *the mineral repository of the State.* It includes in very large quantities, and of good quality, some of the most important of all mineral substances. The importance and value of any mineral substance is strictly dependent on its quality, quantity and accessibility. The chief or most valuable mineral substances are stone coal, iron ore, aluminum minerals, barite, manganese, lead ore, gold, marble, building stones, paving stones, curbing stones, slates, millstones, grindstones, whetstones, lithographic stones, road and ballast materials, hydraulic cement rocks, mineral paint, tripoli or polishing powder, sands, mineral waters, etc.—(*Ib.*, *p. 59.*)

Mica, which the development of electrical machinery has raised to the highest importance, ought to be added to this list of the mineral riches of the Coosa Valley.—(*Geological Survey, Ala., Bull. No. 3, Lower Gold Belt, pp. 17, 23, 27, and Bull. No. 5, Upper Gold Belt, pp. 118, 119.*)

AGRICULTURAL RESOURCES.—

The soils of the Coosa Valley region are of three general classes. 1st, calcareous sandy red loams; 2d, slightly calcareous gray sandy soils; 3d, highly calcareous clayey soils.

Of these, the first, calcareous sandy red loams, cover 2,000 square miles; the second, slightly calcareous gray sandy soils, which are based on or overlie sandstones, sandy shales and chert, cover over 7,000 square miles; the third, highly calcareous clayey soils, cover nearly 1,000 square miles. (*Geol. Surv. Ala., 1897; Coosa Valley Region, p. 105*).

AGRICULTURAL FEATURES AND TIMBER.—

The agricultural capabilities of this region are very great, notwithstanding that over 1,000 square miles of its area are in broken mountains, ridges and hills, and over 7,000 square miles of its area are of naturally very poor sandy and siliceous soils. The principal crops of this region, as a whole, are Indian corn, cotton, oats, sorghum, millet, wheat, field peas, sweet potatoes, etc., with some clover and grasses. . . . The soils and climate, however, are suitable for a much greater diversity of crops. The winters are so slow of approach that frequently the crops are not all gathered until about Christmas.

The timber is still in many places in large forests of soft and hard woods. Lumbering is therefore now, and will be for many years, one of the greatest industries of this region. According to Dr. Chas. Mohr, the highest authority in the State, the native arborescent growth comprises over 125 species, and the grasses that grow without cultivation over 150 species, and the plants of more or less nutritious value that are relished by stock and that are suitable for forage and heavy crops are over 50 in number.—(*Geol. Surv. Ala., 1897; Coosa Valley Reg., p. 107.*)

(1) *Agricultural features and timber of the calcareous sandy red loams.* These are pre-eminently the farming lands of this region. They are not only naturally fertile and rich in all plant food, but they are also susceptible of the greatest improvement and are most retentive of all manures placed on them. They, as a general thing, lie well and do not wash badly. They, therefore, if properly cared for, ought not to wear out, but ought to improve with age or cultivation. Their timber is large and well shaped, but there is very little of it left, as nearly all of their lands have been in cultivation for a great many years.

(2) *Agricultural features and timber of the slightly calcareous gray sandy soils.* These soils, though, as a general thing, naturally poor, being deficient in organic matter and lime, are fine horticultural, fruit and grape-growing soils. They grow especially well almost all kinds of root crops, and they make fine natural pastures. They are well drained and often so lie as to be susceptible of great improvement. By the frequent light applications of suitable composts, they, in many localities, become very desirable farming lands. They are still covered for the most part by their native growths.—(*Ib. 108, 109, 110, 111*).

THE CLIMATE.—

This region lies between latitudes 32 deg. 55 min., and 34 deg. 50 min. Its climate is mild and equable. It never experiences the extremes of heat and cold of some of the more northern States. It is never too hot during the summer, nor too cold during the winter, to stop out-door work. The summers, though long, rarely ever reach a temperature of 100 deg. F., the mean summer temperature being about 75 deg. F. . . . . . The winters are short and comparatively mild, the streams of running water never freezing over and ice seldom forming over one inch in thickness, and the snow rarely falling to a depth of over a few inches, rapidly melting. The mean winter temperature is about 42 deg. F.—(*Ib., 113.*)

WATER-POWER.—

The water-power of the lasting streams of this region is great. There are few of the streams that would not give 8 to 10 feet head of water every few miles, to say nothing of the shoals and water-falls of considerable height that occur along many of them. These streams, with their abundance of water and rocky bottoms and sides, present, at many of the shoals and waterfalls, splendid sites for the erection of machinery of vast magnitude.

The shoals and waterfalls are perhaps the most numerous and greatest along the streams as they pass over the hard strata of the coal measures and Talladega slates, though they are made by the hard strata of all the formations. . . . . The Coosa and Warrior Rivers, alone, if bridled as they leave this region, would doubtless give enough electric power to easily run all the machinery of the State.—(*Ib., 112, 113.*)

RAIN FALL.—

This region is highly favored with abundance of rain and freedom from drouths. Rainy spells and drouths are seldom of long enough duration to seriously affect the agricultural interests. The mean winter rainfall, with melted snow, is about 15 inches, and the mean summer rainfall is about 12 inches.

Lasting springs and wells and streams are common in nearly all parts of the region. It is, therefore, with few exceptions, blessed with an abundance of good water the year round for man and beast.

DRAINAGE.—

The drainage of this region, except in a comparatively few places, is good outside of the *flat woods*. The streams, as a rule, have rapid currents . . . . Much the greater part of their courses are from northeast to southwest, the drainage being almost wholly toward the southwest.—(*Ib., 114.*)

THE FLAT WOODS.—

The Coosa River, from Rome southwest to . . . . Gadsden, swings back and forth across the broad level valley that has been cut in the soft calcareous shales and limestones of the Cambrian. The actual flood plain is not extensive and the highly contorted shales are generally exposed along the banks of the river. The country back from the alluvial flood plain is poorly drained and heavily timbered, and to this the term "*flat woods*" is applied.—(*Geol. Surv. Ala., 1892, Bulletin No. 4, N. E. Ala., p. 20.*)

COAL MEASURES.—

The coal measures of the Coosa coal field are found in the Counties of St. Clair and Shelby.

The coal field in Shelby County covers an area of 110 square miles; the thickness of the measures is 2,000 feet.

The coal field in St. Clair County covers an area of 145 square miles, also with a thickness of 2,000 feet.

There are three workable seams, ranging in thickness from three to four feet. The coal appears to be well suited for coking purposes. A seam of coal, reported three feet in thickness, was struck in the Coosa River in blowing out the channel to Lock No. 2 in the S. E. corner of Section 24, T. 14 N., R. 5 E.—(*Geol. Surv. Ala., Coal Measures of the Plateau Region, pp. 220, 221.*)

The extent of this Coosa coal field is entirely through St. Clair County, a distance of 34 miles, and 24 miles into Shelby County, or an aggregate length in all of 60 miles.

Its breadth is very irregular. Gibson considers that 345 square miles is a close approximation to its productive area.—(*Geol. Surv. Ala., 1895, Coosa coal field, p. 9.*)

This coal field is very narrow in proportion to its length, averaging less than six miles wide, and bordered on both sides by valleys of elevation, with high marginal rims or bordering mountains; it is hence, necessarily, a mountainous and rugged area.—(*Ib., p. 10.*)

The conclusion of the report last cited is instructive in showing that very much yet remains to be discovered as to the actual extent of the Coosa coal measures, and gives ground for the belief that the Coosa region in that respect is of far greater importance than we now dare dream.

The report says:

In the examination of this field, its general structure has been satisfactorily ascertained; and a great increase has been made in our knowledge of its coal seams, and of its coal-producing capacity. Yet much remains to be done to give practical completeness to the investigation. It is an undoubted inference from the structure that many coal seams are yet undiscovered, and many that are known are wholly undeveloped. In some of the basins the underground structure is so completely hidden that only deep boring can reveal their contents.

There are several features of similarity that distinguish these coals, as a class, from other coals. They are highly bituminous, free burning, yet rich in fixed carbon. Soft, easy to mine, free from bone or slaty structure, and also from combined sulphur or *pyrites*, generally called sulphur flakes, and often and fervently maledicted by the miners in other fields.

They long sustain combustion and leave but little ash or cinder and no clinker, and are hence well adapted for raising steam, for forge work, and for all other purposes of fuel.

The most important characteristic of these coals is in their *superior coking qualities*. They will rank among the first-class coking coals.—(*Geol. Surv. Ala., 1895, Coosa coal field, pp. 135, 136, 137.*)

A good authority estimates the trade of the Coosa River now navigable, between Rome, in Georgia, and Lincoln or Lock 4, in Alabama, at $2,000,000 per annum, and the commerce to and from the cities in the valley of the Coosa at more than $20,000,000 per annum, and this without any water outlet. (Major C. F. A. Flag-

ler, U.S.A., cited in Memorial of Coosa River Improvement Convention, Sept. 27, 1899.)

Give this valley and these cities a water outlet by surmounting the obstructions to navigation created by the rapids, and who can set bounds to the estimates of the increase of this commerce?

Not many years ago steamboats plied between Wetumpka, in Alabama, at the foot of the rapids of the Coosa, and Mobile and New Orleans. Complete the system of locks, and steamboats will start from Rome, Georgia, 863 miles above Mobile, for Mobile and New Orleans.

NOTES ON THE RECENT PROGRESS OF IRRIGATION IN THE UNITED STATES.

BY

ALBERT PERRY BRIGHAM.

These notes are derived chiefly from the later irrigation papers of the United States Department of Agriculture and from the irrigation literature of the United States Geological Survey, appearing during the past decade. In the Yearbook of the Department of Agriculture for 1899, the "Rise and Future of Irrigation in the United States" is reviewed by Elwood Mead, Expert in Charge of Irrigation Investigations. This is one of a series of historical papers in the same volume, and is perhaps the most comprehensive single utterance upon the subject.

National Importance Realized.

It can truly be said that we are now beginning to appreciate the meaning of irrigation as a national interest. In the recent annual report of President Wheeler, of the University of California, a department of irrigation is enumerated among the needs of the institution. Almost at once it is reported that such a department has been founded, and that Professor Elwood Mead has been called to fill the chair. The University of Wyoming already gives a course in irrigation; and while specific data are not before the writer, it is safe to say that all agricultural schools within the arid region recognize the subject in some degree. Nor is it forgotten farther east—as, for example, in the horticultural department of the University of Wisconsin. Indeed, all artificial watering of plants falls within the scope of this great department of practical science.

Professor Mead, in the article above named, makes instructive reference to the beginnings of this work in America—in Utah a half-century ago (July, 1849), and at Greeley, Colo. (founded in 1870): "The highest methods both of irrigation and cultivation were sought out through numberless experiments, until Greeley and its potatoes grew famous together. The home and civic institutions of the colony became the pride of the State, and the hard-won success of the community inspired numerous similar undertakings, and furnished an impulse which resulted in the recla-

mations and settlement of northern Colorado." In the light of these inspiring beginnings, the extent of our arid territory gathers surprising meaning. Somewhat more than one-third of the entire territory of the United States, exclusive of Alaska, must depend on artificial watering for its agriculture. Except in limited degree for grazing, these lands have no value without water. With water, they are unsurpassed in fruitfulness. Experts believe that about one-tenth of the total body of arid land can be brought under the plough, if all the water is used to the best advantage. Thus not land, but water, is the great problem of the West. As irrigation is extended, the number of our population increases; towns grow up, manufactures are necessary, railways are multiplied, and the country becomes richer in all the elements of civilization and national prosperity.

It is stated that for Colorado to double the duty of water would increase the public wealth of the State by $20,000,000; to "double the duty" simply means to make the same water contribute effectively to twice the area of production now utilized. Irrigation and tillage are an essential supplement to the mining, timber and grazing resources of such a region. Cheap and abundant food in full variety is essential to symmetrical development of all the resources of the West. From the simple point of view of taxable wealth, therefore, all our citizens, east and west, have an interest in irrigation. This is the phase of the subject which is beginning to command popular and legislative attention at the national capital and throughout the country. The greatness of our problem cannot be better stated than in Professor Mead's comparison of the Nile and the Missouri:

> It (the Nile) supports over 5,000,000 people and pays the interest on a national debt half as large as our own. The Missouri and its tributaries can be made to irrigate three times the land now cultivated along the Nile.

The same writer (Yearbook Dept. of Agriculture, 1899) sets forth the importance of irrigation for the great semi-arid belt of the Dakotas, Nebraska, Kansas and Texas, where thousands of settlers have suffered disappointment and loss in the surely recurring years of drought. Nor is this all. Some of the most recent literature of the subject deals with irrigation, its methods and value, in the humid regions. Thus Bulletins 36 and 87 of the Department of Agriculture, Office of Experiment Stations, give the results of irrigation operations in Connecticut and New Jersey. These papers show the great value of artificial watering, in dry seasons, for fruit, hay and other crops. In his report for 1899

the Secretary of Agriculture makes the interesting statement that a hundred thousand acres of sugar land are under irrigation in Louisiana. Rice fields are irrigated in the Carolinas, and irrigation is on trial in the raising of tea in South Carolina. Thus all the problems of the storage, distribution and application of water become of general interest.

Problems of Irrigation.

From the introduction of irrigation into universities and technical schools, and from the large attention given by government departments, it should appear to all that the highest skill is demanded, and that the fruits of experience must be gathered and transmitted with the least waste to the practical irrigator. Little more than the mention of the problems involved falls within the scope of these notes.

We have first the selection of the land, both as to location and as to quality of soil. If but about one-tenth of the arid region can be brought to tillage, this tenth must be picked with care. If a mistake in location is made, the expense of bringing the water may defeat the purpose of profit. If the best soils within reach of the supply are overlooked, loss will still result. Hence the importance of the soil survey operations now conducted by the Department of Agriculture. Probable accessibility to markets and relation to grazing lands must also be taken into account.

The construction of canals involves questions of engineering, often of no mean kind. How large must the channel be, where it shall run, what will be the losses from leakage—these are among the obvious questions. The duty of water raises another bundle of queries, many of which await full experimentation and records of many years for their answer. The amount of effective work to be done by a given supply of water hinges on soil, climate, crop, and many other conditions.*

Further questions concern the modes of distribution over the land, and of application to various crops, such as flooding, furrow irrigation, and sub-irrigation. The choice of crops raises a query of very great practical, as well as general, interest, viz., the introduction to our own dry regions of plants which, by long periods of modification, have in other lands become adapted to arid conditions. Nowhere is the invading hand of man exhibited more effectively in the distribution of organisms.

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* For compact statement on "duty of water," see Bull. U. S. Dept. Agr., No. 73, pp. 41–43, and Bull. No. 81, pp. 27–29.

The Secretary of Agriculture, in his report for 1899, says:

The Department of Agriculture is searching the dry areas of the world for plants that may be successful in furnishing the materials of food to a greater extent than is now practicable on our semi-arid regions. The introduction of sorghum, kafir corn, dry-land alfalfa, the Russian brome grasses, etc., is enabling the farmers of the states west of the Missouri to extend cultivation over lands that did not succeed in corn, or oats, or clover.

Complications when the Limit is Approached.

When all the available land is wanted for actual settlement, then irrigation assumes the highest importance, and offers the most difficult problems. With the keen attention now given, we may hope that the limits will be approached in the light of experience, and without undue friction and loss. When water from large streams is demanded, the lands will be relatively distant from the tapping point, the canals will be long and large, and the requirements of capital and engineering skill proportionately great. Here we quote Mr. J. C. Ulrich, in Bull. 73, Dept. of Agriculture, upon the magnitude of such works:

Many of these (corporation) canals are more than 50 miles long, and number their water users by hundreds. The Ridenbaugh Canal, in the Boise Valley, Idaho, furnishes water to more than 500 farmers. The High Line Canal, in Colorado, has 433 consumers under it.

Upon many streams of variable volume the water nearly or quite runs away before the season of growing crops. This is true, as cited by Professor Buffum, of some of the best-paying crops, which require water late in the season. Here he names sugar beets, alfalfa, potatoes, and orchard fruits. The same writer continues:

A second-foot of water for the month of August is worth ten to twenty times as much as the same volume for May.

All this brings in the large problem of dams and storage. With storage, and transportation through long canals, in a very dry atmosphere, loss by evaporation becomes highly important. The higher the altitude the greater also the loss. Says Professor Buffum (Bull. 81, p. 22):

In single months which are dry and windy, during the growing season, evaporation of from 7 to 10 inches is not uncommon. For the year evaporation from water surface amounts to four or five times the amount of rainfall. . . . The loss from streams, ditches, and reservoirs in the arid region from this cause is enormous.

In some areas the discharge of streams is very variable from year to year. This must be taken into account. And beyond all other complicating conditions, as the limit is approached, are the "vested rights" of individuals or companies who have taken up lands and used the water according to their own advantage and

without reference to the fullest and most economical development of the region as a whole. This brings us to one of the largest features of our subject, and one which, more pressingly than any other, demands intelligent and firm State and national regulation.

Legal Problems and Public Supervision.

Here we instructively quote from Farmer's Bull. No. 97, Dept. of Agriculture:

> Because of uncertainty of what these rights should be, the irrigation laws of many states have been made so ambiguous and contradictory that the finite intellect is not able to interpret their meaning. As a result there are laws and court decisions to sustain about every view of stream ownership of which the mind of man can conceive. . . . In ten years the water-right litigation of one state is estimated to have cost over a million dollars.

It is interesting to note here the statement of a competent authority, that the statutes of the State of Wyoming have been so wisely drawn as to obviate in great measure such obstruction.

The recent literature shows the evolution of the private ditch, the community ditch, the corporation ditch, the District system of California and some other States, and all leading on naturally to the supervision of the State and national governments. Space forbids many references of great interest, but we must not fail to note the extent of inter-State litigation, and the necessity of some general plan of operation, as in case of the Missouri, whose waters are needed in so many different States. Otherwise there will be no end of litigation as now, or recently, between Colorado and Wyoming on the one hand, and Kansas on the other. Professor Mead puts it, as it seems, none too strongly when he says:

> The entire discussion leads up to one inevitable conclusion: This is, that irrigation, over and above all other industries, is a matter demanding public supervision and control. . . . The nation alone can deal with the conflicting rights in interstate and international streams and with the construction of great reservoirs at their headwaters.

Much might be said of the advantages of irrigation, as they now begin to appear. Not only will the national wealth be enhanced and general prosperity be developed in the West, but farming will be more thorough and exact, its products more diversified, the individual holdings of land smaller, and there will come an admirable training in self-government, and the management of private and public affairs.

Irrigation Study and Literature.

Only hints can here be given of the channels through which this work is carried on. The Secretary of Agriculture, in his report for

1899, informs us that the first appropriation for investigation by that department became available July 1, 1898. Soon after, a conference of experts was held in Denver, and the work was organized under the direction of Professor Elwood Mead, for study and publication in co-operation with the experiment stations. A series of publications has appeared, from which the foregoing notes have been largely derived.

We now turn to the irrigation work of the United States Geological Survey. As the Department of Agriculture deals chiefly with the equitable distribution and profitable use of water, so the Survey is charged with the study of the water supply, and is gradually furnishing the irrigator with the data which he imperatively needs for sound progress.

The first report of the Irrigation Survey, as it has been called, appeared as one volume of the tenth annual report of the United States Geological Survey in 1890. Successive reports since that time have recorded the progress of the work. Seven quarto volumes in as many years have been devoted wholly to irrigation and general hydrography, besides important papers in other volumes of the Survey reports. In Part 2 of the Eleventh Annual Report (1891) the reader will find a good account of the needs of the arid regions in the form of statements by Major Powell before a Congressional Committee. In the same volume, 44 double-column pages are filled with a bibliography of irrigation, confessedly incomplete even at that time. The next report shows that 147 reservoir sites had been surveyed during the previous year, and contains also an extended report on irrigation under the direction of the English Government in India. This report was a record of investigation by Mr. H. M. Wilson, the author of a valuable article on irrigation, published in this BULLETIN in 1898.

Part 3 of the Thirteenth Annual Report contains accounts of the Platte, Yellowstone, and Upper Missouri basins, and a full review of irrigation engineering in the United States. The Seventeenth Report (1895–'96) has a discussion of the water resources of Illinois, also a paper by N. H. Darton, on artesian supply in the Dakotas—a phase of the subject which is destined to become more and more important, especially for regions at some distance from the mountains and their more abundant waters. At the time of Mr. Darton's writing, about one hundred farms were thus served in the region described.

In the Eighteenth Report, for 1896–'97, we again encounter a portly volume of 750 pages, giving progress of stream measurement

in all parts of the United States, well called a "taking account of stock," as over against the earlier "haphazard" ways. This report gives data for the Potomac, Shenandoah, and James, and, farther south, for the Roanoke, Tar, Catawba, and other waters. Thus the work of the Survey is available for problems of municipal water supply, as well as for agriculture. This volume also contains a report by Leverett on the waters of Indiana and Ohio, and an essay on reservoir construction.

In the Nineteenth Report we have another large volume devoted chiefly to stream measurements. Eastern rivers here receive larger attention than heretofore, and we find very full data upon the rivers of Maine—with the Merrimac, Connecticut, Hudson, Delaware, and Susquehanna. The Rock Waters of Ohio are discussed by the late Dr. Edward Orton, and Mr. N. H. Darton reviews the water supply of Western Nebraska. In the Twentieth Report the volume on Hydrography includes a report by Mr. A. P. Davis, detailed to investigate the hydrography of Nicaragua in the interests of the interoceanic canal project.

In addition to the annual reports, as authorized by act of Congress in 1896, a series of pamphlets has been issued, known as Water-supply and Irrigation Papers. About thirty of these have now appeared, and many subjects of immediate value to irrigators are treated. Several papers give accounts of irrigation in special regions—as, for example, near Greeley, Colo., and near Fresno, Cala. Five deal with windmills and pumping operations, two take up sewage irrigation, one discusses water-rights, and several are devoted to water supply.

This review would be incomplete without reference to the National Irrigation Association, of which Mr. George H. Maxwell is Executive Chairman and Mr. Guy E. Mitchell, Corresponding Secretary. It has a Washington office located at Room 6 Glover Building. Under the auspices of this association, an Irrigation Congress was held at Chicago late in November, 1900, and its proceedings at that time attracted attention throughout the country. The objects appear to be the dissemination of information and the promotion of national legislation on this subject. The advocates of such public action claim that no burden will be imposed on the East for the benefit of the West, but rather that the lands under the ditch can be sold to settlers at rates that will fully reimburse the Government for outlay in the construction of reservoirs and canals:

> This reclamation, when accomplished, will add to the permanent taxable national wealth beyond the computation of any man. And it is easy to imagine what all this

will mean to the Eastern factory-owner, to the wholesalers, to every factor of production in the East; also, what it will mean in the way of increased freight and passenger earnings of every railway system in the nation when arid America is redeemed.

The foregoing is quoted from one of the addresses made in Chicago. If the view seems too optimistic to some, it must at least command attention. Perhaps no single economic problem in the United States is equal in importance to this, and certainly no theme surpasses irrigation in its typical geographical quality.

M. FROIDEVAUX'S PARIS LETTER.

PARIS, January 17, 1901.

If, in studying the different official geographical institutions of France, it is not absolutely indispensable to follow a strict chronological order, the case is very different with regard to private institutions. In fact, all our geographical societies have been modelled upon the oldest of all—the Société de Géographie, of Paris, the most ancient in the world. It is of this Society that I propose first to speak.

Its establishment dates from the year 1821, but it would be an error to conclude that the question of founding a geographical society in France had not previously suggested itself. It was in 1785 that an anonymous writer—who was, perhaps, the geographer J. N. Buache—submitted to the approbation of one of the Ministers of Louis XVI. a complete plan for constituting an association intended to *carry the science of geography to its utmost possible perfection.*

The King, whose interest in geography is well known, might possibly have looked with favour upon the plan for the creation of this company (which seems to have been a kind of geographical academy) if it had been laid before him; but, to the great detriment of French cartography, the project never became vital.

A few years later, soon after the period of The Terror, there was founded in Paris a *Société de l'Afrique Intérieure*, after the manner of the *African Society*, formed in London in 1788. The astronomer Jérôme Lalande, author of a memoir, famous in its day, on the interior of Africa, and a persistent propagandist of all enterprises directed towards the Dark Continent, seems to have been the founder of the new Society, which was joined immediately by the distinguished traveller Le Vaillant, by Bougainville and Baudin. Little is known of its transactions; but the Society was still in existence in the year IX, when it gave a banquet to Baudin, who was making preparations for the voyage to Australia to which he owes his reputation.

Afterwards removed to Marseilles, the Society published a body of rules which shows that it was engaged in creating a complete scientific organization, like those of the modern geographical societies: public meetings with lectures, award of prizes, publication of memoirs and library—nothing is wanting; it was even pro-

posed to form a natural history collection, probably with the objects brought back from Africa by travellers commissioned by the Society. But all these projects came to naught, all trace of the Society is lost after the 9th of August, 1802, and if it survived for a time it was without attracting attention or carrying out any of its plans.

The Société de Géographie was founded in 1821 by "several persons earnestly desirous of contributing by their united efforts to the progress of geography." Among the first associates were Conrad Malte-Brun, Jomard, Barbié du Bocage, Letronne, and others, and the first president of the Society was the illustrious Laplace. After having founded prizes, created a publication, the *Bulletin* (which was issued without a break from the month of June, 1822, to the close of the year 1900), and established the publicity and the regularity of its meetings, this oldest of all geographical associations entered upon its existence and labored with all its power, while closely following the advance in our knowledge of the globe, to cultivate in France the taste and the study of geography. I propose to explain in my next letter the present working and the organization of the Société de Géographie.

On the 5th of December, 1900, the Société received, at the Sorbonne, the members of the Saharan Mission which, under the prudent and skilful direction of M. F. Foureau and the regretted Comm. Lamy, established communication between Algeria and the French Congo. Crampel, in 1890, had laid down the great lines of the plan followed out by the Gentil expedition from the Congo to the Tchad in 1897, and by that of the Saharan Mission to the same great lake.

M. Foureau was singularly well fitted to accomplish his difficult task. In 1876 he explored the Sahara, carefully studying the region south of Algeria and remaining for a time in the Oued-Rirh, and accomplishing in the south, from the year 1883, nine successive expeditions for the Ministry of Public Instruction, all fruitful in scientific results, geographical surveys, astronomical and meteorological observations, and collections of all kinds. When he set out in 1898, on his last expedition, his journeys amounted to a total of 21,000 kilometers, 9,000 of which were in new regions. Of these 21,000 kilometers two-thirds had been surveyed on a scale of 1:100,000, and 500 points had been established by determinations of longitude and latitude. Not content with the physical examination of the regions traversed, M. Foureau had studied the inhabitants, their state of mind and their manners and language, so as to acquire a real ascendency over them. Such efforts were worthy of

recompense. After having been baffled for several years by the obstinate ill-will of the Touaregs, and recognizing that the only certain way of succeeding in a great exploration of the Sahara was to do without the natives and to travel with an escort of 150 faithful men, well disciplined and well armed, M. Foureau found at last his Mæcenas, and was able to carry out his long-cherished design.

The difficulties encountered from October, 1898, to April, 1900, when he met M. Gentil at Mandjafa, were related by M. Foureau to the Société in a style full of colour and charm, and may be read in the December number of *La Géographie.* The scientific details will be published at a later day; it is enough now to mention that M. Foureau determined the principal points of his march by 512 astronomical observations. Geology, botany, ethnography—nothing was overlooked by him; but passing over his collections, the Minister of Public Instruction congratulated M. Foureau that he had shown himself throughout his journeys heroic without ceasing to be humane.

At a later session of the Société, M. Bonnel de Mézières rendered an account of his expedition to the Upper Ubangi, the M'Bomu and the Bahr-el-Ghazal, with results fruitful for science as well as for commerce.

In another part of Africa, Capt. Woelffel, in 1899, filled up a blank previously existing on the map in the countries of the Sudan between 9° and 6° 40′ N. Lat. and 7° and 9° W. Lon. M. Chesneau, in a note published in *La Géographie*, shows that M. Woelffel explored the country which constitutes the water-shed between the basin of the Niger and the smaller basins along the coast of the Atlantic. This is much the most elevated and the most broken region of the whole Sudan.

In Asia M. Grenard is exploring the little-known country within his consular district. From his residence of Sivas he made in the autumn of 1900 a journey beyond the Euphrates, visited the Kurds, and brought back numerous corrections for the existing defective maps of that region.

M. Bonin, already known by his explorations in China, has not yet published the results of his last journey, but his address before the Société in January establishes the value of his work. He has recently contributed to the *Revue Coloniale* a "Note on the Navigability of the Yellow River." There is, it appears, no insurmountable obstacle to the navigation of the Hoang-Ho.

The holidays produced some works interesting to geographers. One, *Notre Epopée Coloniale*, by M. P. Legendre, traces the history

of French colonization from the earliest times—that is to say, from the period when the Normans ventured as far as Guinea, in Western Africa, from the time when Jean de Béthencourt colonized the Canaries—to the end of the XIXth century. This work is historical as well as geographical, but the book published by Father Piolet on Madagascar is exclusively geographical. Father Piolet has lately visited the great island, to which he had already devoted several works. The present volume is the first of a superb collection on the *Empire Colonial de la France*, to be written by contributors of indisputable authority. The artistic part of this handsome series will be under the charge of M. Gervais Courtellemont. A companion work to that of Father Piolet is the *Voyage du Général Gallieni autour de Madagascar*, edited by an officer on the staff of the Governor-General.

More and more our geographical literature tends to become colonial. In this place particular mention is due to Father Piolet's book, entitled *La France hors de France*, which contains not only an excellent study of demography (wherein the author proves that, if the Frenchmen emigrate very little, there exists none the less in France a very considerable number of men fit for emigration and who ought to emigrate), but also a very serious study of economical geography on our best colonies—Algeria, Tunisia, Madagascar, New Caledonia. It is to these, says Father Piolet, that our emigrants should, above all, betake themselves. This part of *La France hors de France* forms in some respects a pendant to the excellent work recently published in London by Mr. Hugh Robert Mill, under the title of *New Lands: their Resources and Prospective Advantages*.

The work in which M. Charles Michel has just related the fruitless march of the expedition to which he belonged to meet Marchand recommends itself by other qualities. It is a very detailed and lively account of the journey towards Fashoda from Jibuti to the confluence of the Sobat and the Juba; it contains also the account of the excursion performed by the regretted Maurice Potter and by M. Faivre de Goré as far as the White Nile, an excellent study of the Abyssinians, and a remarkable statement of some of the causes which brought about the failure of the French projects on the Nile. Scientific appendices and reproductions of photographs and drawings add to the value of this volume.

Another remarkable work is that of Father Lambert on the *Mœurs et Superstitions des Néo-Calédoniens*. Father Lambert has studied curiously and with patience the life of the strange people among whom he has lived since the year 1856. His observations

on the Bélep tribe, which inhabits the north, and the natives of the Isle of Pines, have led him to the conclusion that the manners of the peoples of the north and of the south of New Caledonia are practically identical. It would be well if there existed, on the people of each one of our colonies, a work as carefully executed as this of Father Lambert, which has but one weakness—its engravings are a little primitive in style.

I may mention also the book in which M. A. Foucher describes his two years' travel in an interesting Asiatic region—*La Frontière Indo-Afghane*; and another, *Voyages en Patagonie*, written by M. Henri de la Vaulx, recounting his adventures in Patagonia, where he collected the precious anthropological and ethnographical objects now in the Muséum d'Histoire Naturelle and in the Musée d'Ethnographie du Trocadéro.

HENRI FROIDEVAUX.

OBITUARIES.

Luciano Cordeiro.

This distinguished Portuguese geographer died at Lisbon on the 22d of December, 1900, at the age of fifty-six years.

Senhor Cordeiro entered the navy as a midshipman, but soon left the service in order to devote himself to a literary career and to journalism. As a writer and a member of the Chamber of Deputies, in which he sat for a time, he was recognized at home and abroad as a vigorous and able champion of his native land.

His interest in geography was manifested throughout his career. He was the founder of the Lisbon Geographical Society, its Secretary from its beginning in 1875, and one of the contributors whose labours have made the volumes of the *Boletim* a storehouse of information on the history of Portuguese discovery and colonization.

Serpa Pinto.

Alexandre Alberto da Rocha de Serpa Pinto, one of the famous African explorers of the last century, died at Lisbon on the 29th of December.

He was born in 1846 at Tendaes, on an affluent of the Douro. In 1848 the family removed to Brazil. On their return, ten years later, Alexandre entered the Military College, and received, in 1864, a commission in the Seventh Infantry. For some years he served in East Africa.

In 1871 he returned to Europe and remained there for six years, engaged in the routine of military duty, but cherishing the thought of exploring Africa and preparing himself by study for the task:

> An officer in the army, always in garrison in small provincial towns, I was accustomed to convert my leisure hours into hours of labour, and, though the opportunity of exploring Africa seemed to be problematic and very remote, the study of the questions which relate to it became my ordinary pastime; nor did I neglect astronomy. In this way my life in barracks, once my military duties discharged, was divided between the heavens and Africa.—(*How I Crossed Africa, Vol. 1, p. 1.*)

His opportunity came in 1877 when, with Brito Capello and Roberto Ivens, he set out from Benguela on the expedition to explore the hydrographic relations between the basins of the Congo and Zambezi. At Caconda the three leaders parted company; Capello and Ivens went to the north, while Serpa Pinto continued his march to the eastward by a route which he was the first to map. He descended the Zambezi, crossed the country to the eastern

edge of the Kalahari Desert, and early in 1879 embarked at Durban, having passed through the South African Republic.

Another expedition, undertaken in 1884, was broken up by failing health.

In 1894 Serpa Pinto attained the rank of general, and was made governor of the Cape Verde Islands.

Alvan S. Southworth.

Mr. Southworth died on the 7th of January, at the age of fifty-five years.

He was born in Lockport, N. Y., and entered the Naval Academy, when it was situated at Newport, during the Civil War. He was not graduated, however, but withdrew and went abroad.

He was a newspaper correspondent during the Franco-Prussian War, and afterwards went to Egypt. He returned to America in 1873 and was elected Recording Secretary of this Society, a position which he held for three years. After his retirement he became a writer for the periodical press.

His Egyptian experiences are recorded in his book, *Four Thousand Miles of African Travel*, published in 1875.

ACCESSIONS TO THE LIBRARY.

January–February, 1901.

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Bassett, James.—Persia, the Land of the Imams. New York, Charles Scribner's Sons, 1886. 8vo.

Beckley, Hosea.—History of Vermont. Brattleboro, G. H. Salisbury, 1846. 16mo.

Benger, G.—La Roumanie en 1900. Paris, H. Le Soudier, 1900. 8vo.

Beseke, C.—Der Nord-Ostsee-Kanal. Kiel und Leipzig, Lipsius & Tischer, 1893. 8vo.

Brymner, Douglas.—Report on Canadian Archives. Ottawa, Appendix to Report of the Minister of Agriculture, 1884. 8vo.

Budd, Thomas.—Good Order Established in Pennsylvania and New Jersey in America, etc., (1685). Reprint, New York, W. Gowans, 1865. 8vo.

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Dujarric, Gaston.—L'Etat Mahdiste du Soudan. Paris, J. Maisonneuve, 1901. 8vo.

Edwardes, Charles.—Rides and Studies in the Canary Islands. London, T Fisher Unwin, 1888. 8vo.

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FOGG, ALONZO J.—Statistics and Gazetteer of New Hampshire. Concord, N. H., D. L. Guernsey, 1874. 8vo.

FOUCHER, A.—Sur la Frontière Indo-Afghane. Paris, Hachette, 1901. 16mo.

GORDON, LINA DUFF.—The Story of Assisi. London, J. M. Dent & Co., 1900. 8vo.

HALES, JOHN G.—Survey of Boston and Its Vicinity. Boston, Ezra Lincoln, 1821. 12mo.

HALLIER, ERNST.—Helgoland. Hamburg, Otto Meiszner, 1869. 8vo.

HAMERTON, PHILIP GILBERT.—Round my House: Notes of Rural Life in France. Boston, Roberts Brothers, 1885. 16mo.

HARRISSE, HENRY.—Découverte et Evolution Cartographique de Terre-Neuve. London, Henry Stevens, Son & Stiles, 1900. 4to.

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HUNTER, F. M.—Account of the British Settlement of Aden in Arabia. London, Trübner & Co., 1877. 8vo.

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Informe del Ingeniero Elmer L. Corthell sobre los Canales de Acceso al Puerto Madero. Buenos Aires, 1900. 8vo.

From Dr. H. Fritsche, Author:

Die Elemente des Erdmagnetismus und Ihre saecularen Aenderungen während des Zeitraumes 1550 bis 1915. Publication III. St. Petersburg, 1900. 8vo.

From James Green, Author:

Causes of War in South Africa. Paper read before the Worcester Society of Antiquity. Worcester, Mass., 1900. 8vo.

From Benjamin Smith Lyman, Author:

Movements of Ground Water (Reprint from Journal of the Franklin Institute), October, 1900, 8vo; Notes on Mine-Surveying Instruments, etc. (Canadian Meeting, American Institute of Mining Engineers, August, 1900), 8vo; Importance of Topography in Geological Surveys (Reprint from the Mining and Metallurgical Journal, Vol. XXIII, No. 5), Dec. 1, 1900, 8vo.

From Henri de Sarrauton, Author:

Jour et Cercle de 24 Heures. *Extrait du Bulletin de la Société de Géographie d'Alger*, 3e Trim., 1900. 8vo.

From the South African Museum, Cape Town:

Annals: Vol. II, Part IV, Dec. 4, 1900.

From Dr. Guilherme Studart (Barão de Studart), Author:

Apontamentos Bio-Bibliographicos. Fortaleza, 1900. 8vo.

From Henry Wallach, F.R.G.S., London:

Map of the Gold Coast, with Part of Ashanti, showing the Positions and Areas of Mining Properties. By Henry Wallach, F.R.G.S. London, Stanford's, November, 1900. 4 sheets, 32×25 in.

From the War Department, Washington, D. C.:

Report on the Census of Porto Rico, Washington, 1900. 8vo; Copper River Exploring Expedition, 1899, Captain W. R. Abercrombie, Commanding. Washington, 1900. 8vo.

NOTES AND NEWS.

THE NEXT MEETING of the Society will be held at Mendelssohn Hall, No. 119 West Fortieth Street, on Tuesday, March 19, 1901, at 8.30 o'clock, P.M. Mr. Herbert M. Wilson, of the U. S. Geological Survey, will deliver a lecture on Examples of Topographic Forms in the United States.

At the meeting to be held on Tuesday, April 16, Prof. Charles L. Bristol, of New York University, will address the Society on the Geography of Bermuda.

IT IS ANNOUNCED that the Weather Bureau has now established stations for meteorological observation, from the northern coast of South America to Hamilton, Bermuda. This point is connected by cable with Halifax, Nova Scotia, and the chain of posts thus completed brings within reach a more accurate forecast of weather conditions on the ocean and the east coast of the United States.

Arrangements have also been made by the Weather Bureau for a daily report from the Meteorological Observatory at St. Michaels, Azores, to be collated with telegraphic reports from London of the conditions to the west of Spain, France and Ireland, so as to furnish an approximate survey of the weather on the Atlantic.

The Bureau has begun to issue to the captains of European steamers leaving New York predictions for three days out, with forecast of wind force and wind direction. Similar predictions are supplied to the officers of steamers leaving European ports for this country.

MORE THAN THREE HUNDRED pages in the Annual Report of the Geological Survey of New Jersey for 1899 are devoted to a Report on Forests, illustrated by 31 plates and a number of maps in the text, and an atlas of seven large-scale sheets, showing the wooded areas of the State.

The Report says that New Jersey has ceased to be a lumber-producing State, most of the large timber having disappeared before 1860.*

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* A foot-note says: "The largest white-oak tree in the State is in Gloucester County, three miles north of Mickleton, and its dimensions, as given by Dr. J. T. Rothrock, are: Height, 95 feet; diameter of trunk, three feet above the ground, 7 feet 10 inches; spread of branches, 118 feet."

This tree, it is added, is older than the settlement of the country.

Taking the State as a whole, it appears that there is now nearly as much forest as there was in 1860, and that the deciduous timber has increased in size and improved in quality within the past twenty years.

The forest area of the State amounts to 2,069,819 acres, or 46 per cent. of the upland area. This is almost exactly equal to the area of improved land in farms.

DR. REGINALD A. DALY, of Harvard University, is to conduct an exploring expedition to Labrador, Greenland and Iceland in the summer of 1901. The plan is to charter a steamer of 1,000 tons to accommodate a party of sixty men. The main object of the voyage will be to study the lava fields, geysers and glaciers of Iceland, the fiords and glaciers of the west coast of Greenland, and the mountains and fiords of northern Labrador. A hunting party may be landed for a fortnight or three weeks in Greenland, and also in Labrador. Explanatory lectures on the regions visited will be given by the leader of the excursion. On the Labrador coast Dr. Daly will act as guide himself, as he spent the summer of 1900 there with a party. In Greenland and Iceland specialists on the geology and physical geography of those countries will lead the expedition.

AT A MEETING of the Italian Geographical Society, held on the 14th of January, the Duke of the Abruzzi and Commander Cagni told the story of their famous Arctic expedition to an audience which included the dignitaries of the kingdom and of the city of Rome, the members of the Diplomatic Corps, the royal family, and the King and Queen of Italy.

The work of two explorers in the Arctic, the Duke said, had especially attracted his attention for the immense distances travelled with dog sledges; these were the journeys of Peary on the inland ice of Greenland and those of Wrangell in northern Siberia.

The plan of a polar expedition took definite shape in his mind in January, 1899, after conferences held with Nansen.

This plan was simple enough: to establish a base in Franz Josef Land, and from that to push towards the Pole in sledges.

The base chosen was Teplitz Bay, on the west coast of Kronprinz Rudolf Land, and it was here that on the 9th of September the *Stella Polare* narrowly escaped destruction from the closing in of the ice.

In December began the preparations for the sledge journey to

the north. Two days before Christmas the Duke and Comm. Cagni, returning from an excursion with the dogs, missed their way and fell into the bay from a height of about twenty feet. They were rescued in a half hour, but with frozen fingers.

The temperature in January ranged from 30° to 40° below zero (Cent.), 22° to 40° below zero (Fahr.). The health of the party was excellent.

Thus far the Duke. Comm. Cagni followed with a brief account of the sledges, the manner of loading them with provisions and instruments, and the measurement of supplies for a contemplated journey of 480 miles in 45 days:

"Certainly," *he said*, "it seemed over-bold, even to ourselves, to count upon a daily march of more than ten miles; but the example of Wrangell and of Peary filled us with hope greater than the discouragement we found in the experiences of Parry and Markham, and even of Nansen. And upon these definite bases we made all our preparations."

He then described, with simplicity and force, the start on the 21st of February, the events of the journey, the violent winds and the bitter cold, and the steady progress in the face of difficulties. On the 22d of March it was decided to send back to the camp the first group of three—Lieut. Querini, the guide Ollier and the machinist Stökken. They set out the next day, to be seen no more.

It was the 11th of May when the party reached the highest north in 86° 33′. Three tin cylinders, containing the record, were deposited on the spot, and the homeward march was begun. The rate of travel, which had generally fallen below the ten-mile standard, now exceeded it, and Teplitz Bay was reached on the 22d of June.

Capt. Cagni notes that, with the exception of the reindeer boots, the borders of the hoods and sleeves, and the sleeping-bags, the wearing apparel of his party was of cloth and wool.

The Duke of the Abruzzi summed up the geographical results of the expedition as follows:

Petermann Land and King Oscar Land are to be erased from the maps;

Cape Sherard Osborn certainly forms no part of Kronprinz Rudolf Land, and the Duke, in his long stay at Cape Fligely, was unable to discover any land in the direction assigned by Payer to Cape Sherard Osborn;

The islands marked in Wellman's map to the north of Hvidtland, between that and Kronprinz Rudolf Land, were not to be descried from Cape Fligely, which is, therefore, the most northern point of the Franz Josef group; not, as marked on the maps, in 82° N. Lat., or over, but in Lat. 81° 51′.

THE FOLLOWING NOTE appears in *Nature*, of January 10:

The fall of two of the stones of the outer circle of Stonehenge, on the last evening of the nineteenth century, directs attention to the necessity for at once taking steps

to preserve this remarkable prehistoric monument. . . . An engineer, writing to the *Times,* suggests a method of undermining the stones, and imbedding them in a foundation of concrete or cement. A scheme of this kind would cost comparatively little, and there should be no difficulty in obtaining funds to carry it out. . . .

WORK ON THE International Catalogue of Scientific Literature was to begin on the 1st of January, 1901, and to include all literature published after that date.

The Royal Society act as publishers of the Catalogue and sign the necessary contracts.

At the end of December the number of copies of sets subscribed for was 290, of which the United States take 68, Great Britain and Germany each 45, France 35, Italy 27, Japan 15 and Switzerland 7; Sweden subscribes for 6½ and Canada for 4½ sets.

The annual cost of each set is 17 pounds, or 85 dollars.

Three countries—Russia, Belgium and Spain—have not yet joined in the scheme.

MR. BORCHGREVINK addressed the Berlin *Gesellschaft für Erdkunde*, on the 2d of February, on the subject of his Antarctic expedition.

It was on the 30th of December, 1898, that the *Southern Cross* encountered, in S. Lat. 51° 56′, the heavy pack ice which held her fast till January 26, with a pressure that sometimes lifted the ship four feet. Open water was reached at last, and on the 16th of February Victoria Land was sighted, and the next day the ship entered Robertson Bay; the stores were landed and the tent was set up at Camp Bidley, the winter station. The tent was protected on all sides by sloping walls, and, thanks to this precaution, it was able to resist the fury of the terrible southeast storms.

Borchgrevink climbed the steep cliffs of Cape Adare to the height of 1,376 feet, finding traces of vegetation at 800 feet.

The winter began to make itself felt early in March. The first aurora was seen on the 15th of March, and then came fearful storms—the wind blowing as much as eighty-seven miles an hour.

The polar darkness was felt to be strangely depressing by every one. The only distractions were chess and cards, until there was a prospect of varying the monotonous bill of fare by the addition of fish, when all took to fishing.

In the middle of August the thermometer marked 46° below zero (Cent.) (51° below zero Fahr.). Several excursions were made during the winter, and Borchgrevink discovered in the mountains minerals of value, over which he hoisted the English flag. Returning from

one of these excursions, in October, he found the zoologist Hansen in a dying condition.

The penguins and the gulls began to come at the end of October. The storms seemed to increase, and one blew ninety-nine miles an hour. These tempests Mr. Borchgrevink seems to regard as peculiar to the Antarctic, and he says they are never to be left out of the calculation when an expedition is planned.

Preparations were made to observe the eclipse of the sun on the 3d of December, but the sky was covered with clouds.

It was noted, however, that there was a change of temperature during the eclipse.

Early in February, in the neighborhood of Possession Island, favorable magnetic observations enabled the explorers to calculate the position of the magnetic south pole. A landing was made on Franklin Island, and the volcanoes Terror and Erebus were visible in the south—the latter in activity. There is a small flat beach at the foot of Mt. Terror, and, while waiting there for the return of the boat from the ship, Borchgrevink and Captain Jensen narrowly escaped death. An iceberg plunged from a glacier into the sea and threw up a wave which swept over them and almost tore them from their hold on the crags.

We regret to record the death, on the 14th of January, of the Cavaliere Ingegnere MATTEO FIORINI, for many years Professor of Geodesy in the University of Bologna.

TRANSACTIONS OF THE SOCIETY.

JANUARY–FEBRUARY, 1901.

The Annual Meeting of the Society was held at Mendelssohn Hall, No. 119 West Fortieth Street, on Tuesday, January 22, 1901, at 8.30 o'clock. P.M.

President Low in the chair.

The following persons, recommended by the Council, were elected Fellows:

R. Napier Anderson.
Alexander Brown, Jr.
Henry De Coppet.
Rev. James S. Dennis.
Henry Belknap.
Miles M. Dawson.
Anson R. Flower.
Frederick S. Flower.
David Willcox.
James Curran.
James J. Faye.
Baron H. Arnous de Rivière.
Charles H. Haswell.
Augustus L. Hyde.
George B. Hopkins.
Alexander P. Ketchum.
G. Weaver Loper.
Thomas E. Kirby.
R. Johnson Held, M.D.
H. B. Laidlaw.
J. P. Morgan, Jr.
Austin W. Lord.
William Lawson.
Thomas H. Hubbard.
V. Everit Macy.
Dr. George N. Miller.
Louis Sather Bruguière.
Henry Hentz.
F. Warren Montgomery.
Wainwright Hardie.
Herman Vogel.
Harry H. Meyer.
Henry E. Montgomery.
John S. Durand.
Charles H. Marshall.
George H. Macy.
John W. T. Nichols.
Carl Fischer-Hansen.
Dunham Jones Crain.
W. F. Owens.

The Annual Report of the Council was then submitted and read:

NEW YORK, January 5, 1901.

To the American Geographical Society:

The Council respectfully submit the following report for the year 1900.

The number of Fellows on the 1st of January was 1,164. The additions during the year number 50. The losses by death, resignation, etc., were 97, and the total Fellowship on the 31st of December was 1,120, of which number 297 were Life Fellows.

The additions to the Library number 4,232, viz.: Periodicals and Pamphlets, 2,655; Books, 1,253; Maps and Charts, 301; Atlases, 23.

Six meetings of the Society were held in the year. That of January was devoted

to a commemoration of the late President Charles P. Daly. At the other meetings papers were read by:

Prof. T. C. Mendenhall on the Alaska Boundary;

President Schurman, of Cornell University, on the Philippine Islands and their People;

Herbert L. Bridgman on the Cruise of the Diana and Peary's Work in the Arctic;

Edward Whymper on Mountain Climbing, Twenty thousand Feet above the Sea;

W. A. P. Martin, D.D., On the Siege in Peking: its Causes and Consequences.

There have been published in the BULLETIN, which has appeared with regularity, twenty-three original papers, besides the usual Record and Scientific notes.

For the condition of the finances, reference is respectfully made to the report of the Treasurer, herewith submitted.

The Society's building in Eighty-first street is in process of construction, and the architects promise its completion before midsummer. There have been expended on the lots and building $158,519.73—of which amount generous friends of the Society have furnished $32,165, and the remainder has been paid out of the resources of the Society. Since the last report the following additions to the Building Fund have been made *:

W. J. Bormay	$15 00
James Douglas	250 00
John Greenough	1,000 00
J. J. Higginson	100 00
J. J. Hill	100 00
Gustav E. Kissel	500 00
Chandler Robbins	500 00
T. G. Sellew	250 00
	$2,715 00

The establishment of the Society in this ample and commodious home will relieve it of the embarrassments under which it has labored for so long a time, and increase in every way its power for usefulness.

All of which is respectfully submitted.

HENRY PARISH,
Chairman.

LEVI HOLBROOK,
Secretary.

The Report of the Treasurer was then presented and read:

AMERICAN GEOGRAPHICAL SOCIETY.

General Account.

The Treasurer respectfully reports that on January 1st there were in the Union Trust Co	$5,154 27
During the year there have been received from Fellowship Dues, Sales of Publications, and interest on invested Funds	16,409 87
From Sales of Investments	73,750 00
Donations to Building Fund	2,715 00
	$98,029 14

* A contribution of two hundred dollars has since been received from Miss Luella Agnes Owen.

There have been expended for Salaries, Library, Publications, Meetings, House a/c, Insurance, Postages, etc., etc.	$11,243 15	
And there have been paid on account of construction of the Society's new fire-proof building on West 81st street	67,138 92	
		78,382 07
On December 31st there are in the Union Trust Co. to the credit of General Account		$19,647 07

NEW YORK, December 31, 1900.

W. R. T. JONES,
Treasurer.

REPORT OF THE NOMINATING COMMITTEE.

The Committee appointed to recommend to the Society suitable persons to be elected in January, 1901, to fill vacancies then occurring in its offices, respectfully report :

That they would recommend the election of the following named persons to the offices below designated :

President—SETH LOW, term to expire in January, 1902.

Vice-President—D. O. MILLS, term to expire in January, 1904.

Treasurer—WALTER R. T. JONES, term to expire in January, 1902.

Recording Secretary—ANTON A. RAVEN, term to expire in January, 1904.

Councillors—LEVI HOLBROOK,
MORRIS K. JESUP,
GUSTAV E. KISSEL,
HENRY PARISH,
JOHN A. HADDEN,
Terms to expire in January, 1904.

Respectfully submitted.

(Signed.) FRANCIS M. BACON,
W. H. H. MOORE,
S. NICHOLSON KANE,
Committee.

December 20, 1900.

On motion, Mr. Albert Operti was appointed to cast the vote of the Society for the candidates, and they were declared duly elected.

The President returned thanks to the Society for the honor conferred upon him by their choice, now reaffirmed for the ensuing year, and then introduced the speaker of the evening, Dr. A. F. Schauffler, who delivered a lecture on Constantinople.

The lecture was illustrated with stereopticon views.

On motion, the Society adjourned.

A regular meeting of the Society was held at Mendelssohn Hall, No. 119 West Fortieth Street, on Wednesday, February 20th, 1901, at 8.30 o'clock, P. M.

President Low in the chair.

The following persons, recommended by the Council, were elected Fellows:

F. A. Parsons.	William Fitz Hugh Whitehouse, Jr.
Walter Coles Cabell.	John N. Beckley.
J. Harsen Purdy.	William C. Sturges.
Stephen H. P. Pell.	Robert F. Ballantine.
Charles Kohlman.	Geo. Barclay Rives.
Robert Maxwell.	Chas. F. Smillie.
Josiah C. Reiff.	Safford Goodwin Perry.
Thomas B. Rea.	James Pech, LL. D.
Samuel Riker.	Rev. Arthur Lawrence.
Edgar E. Saltus.	Gamaliel Bradford.
Isaac N. Seligman.	William Farnsworth.
William G. Slade.	Edward C. Johnson.
William H. Leupp.	George G. Kennedy, M. D.
Charles D. Stickney.	Albert Matthews.
George L. Stebbins.	William W. Swan.
Charles Robinson Smith.	Alden Sampson.
W. S. K. Wetmore.	E. M. Fulton, Jr.
James M. Wentz.	William Kent.

The President then rose and addressed Dr. Thomas C. Mendenhall, present by invitation, as follows:

It is my privilege to present to you this evening the Cullum Geographical Medal, awarded by unanimous vote of the Council for your long-continued and fruitful labours in the cause of science, and specifically for your valuable services to the science of geography in your position as Superintendent of the United States Coast and Geodetic Survey for the period 1889–1894.

Fitly to direct a branch of governmental work, so important and so far-reaching in its influence, is to deserve well of one's country; and I feel that I give expression to the judgment of all in saying that your administration of the Survey has long called for a public recognition by reason of its unsurpassed efficiency and its high standard of excellence.

Dr. Mendenhall replied:

Nothing has ever come to me more unexpectedly than the announcement that the American Geographical Society had conferred upon me the Cullum Geographical Medal, and nothing that has come has been more pleasing. I can but inadequately express to the Society my gratitude at this more than generous appreciation of my work, but I cannot do less than thank you most sincerely for the high honor of which I am now the recipient. Since receiving the announcement of the Society's action I have spent no little time in trying to discover why it should have been taken. I am not inclined to attribute it to any personal merit of my own, but rather to a disposition to recognize the kind of geographical work in which I have long been interested. I mean by this what I may call geography of precision, not as opposed to, but as parallel with, geography of discovery. This world is so small and geographers have

been so many and so active that geography of discovery is nearing its end. Not many areas now exist that have not been explored by intelligent and courageous travellers. In the geography of position and form, however, very much remains to be done. The dictionary, to which we often last go for the meaning of a word, says that geography is that science which treats of the world and its inhabitants. It is thus the most comprehensive and inclusive of all sciences, and as long as there is anything to learn about the earth or its people the Society will not be without occupation. Certainly such problems as that of the Figure of the Earth, which Humboldt declared to be the most fruitful that has ever occupied the attention of man in the importance of the scientific methods and results that have come from its study, are fit to demand the recognition and support of the Society. And this is also true of problems relating to its motions, its mass, terrestrial gravity, terrestrial magnetism, and all that is included in the term terrestrial physics. It is encouraging to feel that this great Society is ready and willing to recognize in the bestowal of its honors those who have given special attention to this phase of geographical work, and as evidence of this willingness I accept this medal, again assuring you of the great pleasure I have in so doing.

President Low then introduced the speaker of the evening, Dr. George F. Becker, who addressed the Society on the Conditions requisite to our Success in the Philippine Islands.

On motion, the Society adjourned.

BULLETIN

OF THE

AMERICAN GEOGRAPHICAL SOCIETY.

Vol. XXXIII 1901. No. 2

TOPOGRAPHIC NOTES ON THE URAL MOUNTAINS.

BY

CHESTER WELLS PURINGTON.

The study of mountain-regions has resulted in a classification, with regard to orographic features, of the various parts of the continents known to geographical research. This classification is justly, as it seems to the writer, based on age. Its many submodifications are all dependent, primarily, on the difference in length of time during which the given mountain system has been subjected to the forces of erosion and those producing elevation and depression.

The difference of climatic conditions, little or much rainfall, even or uneven and rapidly-changing temperature, may be noted in their effects by the experienced observer, who sees for the first time a given mountain-tract. He will find himself deceived, however, if he does not take into account time, the determining factor of all topographic features of large character.

Considered from a purely topographic standpoint, it may be said that the geological structure itself is subordinate in determining the resulting forms to the all-powerful control of time. Witness in this regard the gigantic masses of Mt. Fairweather and Mt. St Elias on the Alaskan coast, long taken for volcanic mountains by geographers as well as by navigators, and only by close observation and comparison determined to be of sedimentary structure. Or, the writer may cite the dome-shaped mountains seen by him during the past summer along the upper reaches of the Yenisei river, which superficially resemble bosses of plutonic rock, but which on close inspection are seen to be composed of nearly horizontal beds of Carboniferous sandstone.

Perhaps there is no more striking example, in those portions of

the earth's surface already known to investigators, of what may be called deceptive mountain togography than is presented by a study of the Ural mountains in eastern Russia. This field has been long studied from many geological and mineralogical standpoints, and from it have been drawn, in fact, in the fields of palæontology and mineralogy important contributions to the classic nomenclature of those sciences. It is possible that contributions have also been made from this field to the literature of modern geographical study; but the writer, although not familiar with all the work which has been done by the Russian geologists in that portion of the country, feels a reasonable degree of confidence that the Ural has not been considered to any extent from the point of view taken in the present article. Over so large an area notes such as the following must necessarily be of a rather general character. As the observations recorded are, however, the result of a considerable amount of time spent in the field, it is hoped they may be found of value for the purposes of comparison with descriptions of regions better known to Americans.

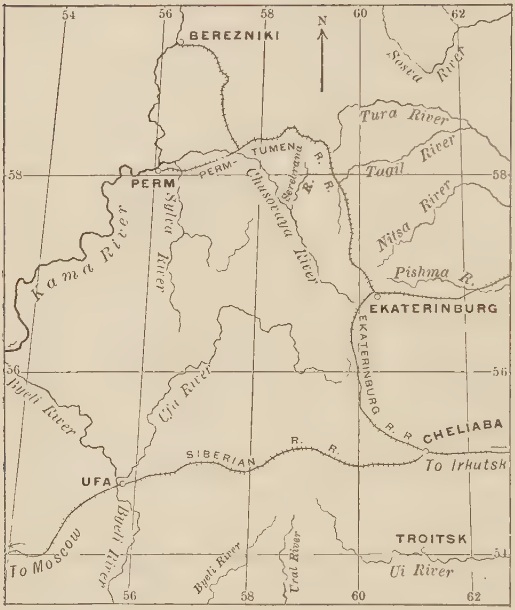
SKETCH MAP OF EUROPE, SHOWING LOCATION OF AREA DESCRIBED. SCALE APPROXIMATELY 700 MILES TO 1 INCH.

From the northern border of the Caspian Sea northward even to the Arctic Ocean extends the broad and poorly-defined series of low mountains and hills known as the Ural chain. Geologically considered, the area in question is a mountain region of the purest type. Metamorphic schists of both igneous and sedimentary origin, with accompanying dikes and laccolites of igneous rock, with every range in composition from the most acid to the most basic, and in structure from sharply-defined porphyritic to purely granular, present a complexity of folding whose problems it is well-nigh impossible to solve. In almost any section followed across the general north and south strike of the rocks will be found numerous

exposures of the schists, exhibiting most intricate folding and minute faulting. In the region between Kushva and Perm, for example, along the Chusovaya river and its tributaries, the extraordinary crinkling of graphitic schists is beautifully set off by the multitude of narrow veins of white quartz interleaved with the laminæ of the schist. In the gold mines of Kochkar, where the underground workings afford opportunity of studying the schistose diorites in a comparatively fresh state, the sections of country-rock exposed in the cross-cuts exhibit all the complicated anticlinal and synclinal structure characteristic of mountain complexes which have been subject to severe disturbances. The saprolitic character of the surface rock interferes with the study of the orographic features in many parts of the country. Indeed it has been found in the mining districts about Troitsk that shafts have penetrated the red, decomposed clayey schists for more than 100 feet before encountering rock sufficiently hard to require a blast. In this particular the Ural region bears a striking resemblance to the southern Appalachians of the United States, and it is the more remarkable inasmuch as the climatic conditions obtaining in the two regions are so entirely different.

The observer is struck as he rides or drives about the Ural with the planed-down appearance of the hills and the entire absence of sharp or accentuated forms. The vast plains, denominated the Steppe, extending from the line of the Trans-Siberian Railroad southward to the Caspian, are, as the strict geographer would use the term, mountains, but so old as to have lost entirely the character of such. An absolute plain is not, so far as the writer knows, to be found in the region, but the Orenburg Steppe must be classed as a peneplain. It will be shown that in all probability this peneplain is not limited in extent, but is part of one great general plain hundreds of miles in length, and in places more than one hundred in width. In the vicinity of Miassky Zavod, on the line of the railway, where the washings for gold-bearing gravels have laid bare large areas of the bed-rock, the intricately folded schists are graphically mapped out on the nearly horizontal floors of the placers. The mountain-complex has been pared down as by some giant knife, and all above the last cut has disappeared. The only indestructible elements, the gold and quartz, have remained, forming a horizontal bed on the top of the edges of the schists. Judging by the comparative richness of the gold placers, and the poverty in this metal of the quartz veins now found in the schists, the mass of material from which this gold came must have been

enormous. It is safe, therefore, to infer that very high mountains have existed here, and that much time has been consumed in the process of denudation to the present level. Evidence of a similar nature is afforded by the deposits of platinum, several hundred miles farther north, along the Iss and Tura rivers.



SKETCH MAP OF PART OF URAL REGION, SHOWING LOCALITIES MENTIONED. SCALE 60 MILES TO 1 INCH.

Although the level of the peneplain approaches in some places the present level of the streams, signs of an uplift after a nearly completed cycle of erosion are everywhere visible. Along the railroad, as, for example, near Cheliabinsk, the amount of re-cutting done by the present streams does not exceed ten or fifteen feet vertically. Toward the south, however, the uplift has been greater, and at the rare intervals where streams occur most striking examples of cañon-like topography are seen. The Sanarka and Ui rivers, one hundred and fifty miles to the south of Miassky Zavod, are examples of a drainage superimposed on a country in which well-defined river-courses were already carved. Measurements with barometer taken along the Ui river showed that the top of the peneplain varies in height from 50 to 200 feet above the present river-bed, the variations being due to the fact of the undulating surface of the Steppe. The main river valley is so sharply cut that, although from one cliff to that on the opposite bank the distance is really 1,000 feet, an observer standing on the surface of the peneplain at an equal distance back from the bank nearer to him would not know that there was a cut in the plain.

The undulations referred to in the preceding paragraph cannot be compared with any feature of topography found within the limits of the United States, so far as known to the writer. The

rolling prairie country of the upper Mississippi valley can hardly be likened to it, since the waves, if they may be so termed, of the prairies are regularly spaced and not of great individual magnitude. The Troitsk and Orenburg Steppe, on the other hand, may be likened, if it is permissible to use the simile of the ocean, to the sea's surface at a time when a calm has succeeded to violent winds blowing at cross-directions. Billows of land of immense proportions are interspersed with smaller ones, and it cannot be said that there is any regularity either in the size of the rolls, in their distribution, or in their distance from one another. The distance from the crest of one wave of the Steppe to that of the following is from two to four miles. Of such a quality is the atmosphere, however, that it is difficult to believe from mere observation that the distances are so great.. One soon becomes convinced in travelling over the ground. The absence of any but the most scant growths of trees in the Steppe regions renders the study of the topographic forms exceedingly easy. In many places the sight is entirely unhindered for distances of fifteen and twenty miles over the immense plains.

The nearly vertical beds of schist and slate cut off sharply at the river-bank form miniature points and promontories similar to those which the writer has seen on a larger scale along the shores of Kadiak Island, in Alaska. Between these cliffs narrow cañons penetrate the plateau for distances of a few hundred feet, occasionally much longer. These cañons of the tributaries have been partially filled with black peat or turf, which, on being closely examined, appears to be little more than compressed, decayed and finely matted vegetable material of a spongy consistency. It is dug out, cut into blocks, and dried for burning by the Kirghiz nomads who inhabit the region. They also use it for banking up the sides and roofs of their winter huts, for the sake of warmth. The turf has frequently a vertical thickness of fifty feet, and it is not easy to account for its origin in this nearly arid region, where there is so little decay of vegetable material. The occurrence would seem to imply that the orographic changes of the region have been accomplished with exceeding slowness to allow of a thick accumulation of decayed vegetable material from comparatively poor sources. For on the Steppe the extraordinary semi-tropical vegetation characteristic of the Siberian forests, and to some extent of the northern Ural, is entirely lacking, and is replaced merely by scant patches of low bushes and patches of growth similar to the American sagebrush.

On the top of the plateau a very thin layer of turf, never exceeding three feet in thickness, is distributed with considerable uniformity. Numerous reefs of quartz and occasionally a band of schist of more than usual hardness form parallel ridges, generally bare of any covering, which may be traced by the eye for long distances across the country. Pits dug through the thin blanket of turf which covers the evenly undulating surface of the Steppe have discovered a bed varying from one to two feet in thickness of fine gravel, well water-worn. This bed lies frequently at a height of 150 feet above the present streams. It rests directly on the upturned edges of the schist, which is found to be of a saprolitic character. The gravel contains rolled particles of gold. It is to be regretted that up to the present this gravel has not been found payably auriferous, otherwise the courses of the ancient channels which the gravel occupies would have been traced. It is, however, a forceful commentary on the nature and origin of the gravel to state that it has been found so high above and so far away from the present water-courses that, although its character of stream-detritus is not to be doubted, it is impossible to extract its values at a profit because of lack of water.

The region of the Ural presents conditions of topographic uniformity at points remotely situated from one another. Thus the high-lying auriferous gravel has been found by the writer, under conditions almost exactly similar to those described above, 250 miles north of the Ui, in the vicinity of the rivers Reft and Pishma. The Pishma region, 100 miles to the north-east of the city of Ekaterinburg, is not Steppe, but is covered with a growth of pine-forest, which, as in all the northern country, serves to conceal in part the topographic details. It is, however, certain that the peneplain which has been described extends over the whole of the Ural, at any rate as far north as the town of Bogoslovsk, latitude 60° N., and it is extremely probable that the water-worn gravel would be found at many points over its surface occupying a position averaging 150 feet above the level of the present drainage.

The Ural chain, in the region lying to the north and south of Kushva, a station on the Perm-Ekaterinburg branch of the Siberian railway, is remarkable for the presence of numerous metalliferous ore-bodies, principally iron oxides of greater or less purity. These ore-bodies are frequently of considerable size, occurring in the form of bosses in the surrounding granular rocks. By their greater ability to resist erosion as compared with the country-rock, they have become, topographically considered, monadnocks in a sur-

rounding sea, so to speak, of peneplain. The most conspicuous examples of these monadnocks are the hills of Blagodatny, near Kushva, and Bogoslovsk, 150 miles to the north. These rise to the height of only a few hundred feet above the peneplain. To the west and north of Bogoslovsk, however, in the almost unexplored wilderness of forest occupying the Ural crest at this latitude, may be seen typical dome-shaped monadnocks rising to 3,000 and 4,000 feet above the plain.

A most striking and comprehensive view of the present topographic conditions is obtained if one mounts to the top of one of the smaller monadnocks in the vicinity of the river Reft, in the forest-covered region between Ekaterinburg and Irbit. Here the peneplain, occupying a position from 150 to 200 feet above the present river-course, is almost level, and covered with an equal growth of pines and firs. The resemblance of the scene to that obtained at some point in the Southern Appalachians of the United States, where similar conditions exist, as, for example, in Northern Georgia, is truly startling. The counterfeiting is aided by the red color assumed by the decomposed saprolitic schists where they are exposed. Indeed, it seems to the writer that no two regions could be, both topographically and geologically considered, more nearly exact counterparts, the one of the other.

Toward the west, in the direction of the Volga, the peneplain lessens very gradually in elevation until it merges into the great plain of northern Europe, which stretches away indefinitely to the west and south. In the course of the railway journey from Kushva down to Perm the results of the former base-levelling are graphically displayed along the course of the Chusovaya river, a large tributary of the Volga, coming from the Ural. The present stream, subject to heavy overflows in the spring, has in its meanderings cut deep and sharp into the sides of the peneplain, which, occupying an elevation of less than fifty feet above the water, is difficult to distinguish from the immense recent flood-plain, composed of gravel, through which the river now makes its way.

It is a remarkable fact, patent to all observers in the district, and worthy of more study than has been given to it by the present writer, that the present streams of the Ural appear for the most part to be filling rather than cutting their channels. In other words, although the streams have cut, as has been said, to depths of 150 feet and more below the surface of the peneplain, they from some cause appear to have nearly suspended this action and wander about with very light grades in the midst of immense plains of

gravel. These plains are typical flood-plains, and are generally of a width about ten times that of the streams which penetrate them. A typical river, or rather creek, of this kind is the Serebrana, a tributary of the Chusovaya, heading to the south of the railroad west of Kushva, and flowing south for a distance of 150 miles. It has the peculiarity of all the streams of the Ural, and, in fact, of Siberia in general—that of retaining the same width for very long distances. The Serebrana will average 150 feet in width, and flows in a gravelly flood-plain of its own making, of a width of 1,000 feet or more. From the sides of this plain rise abruptly on both sides the rather steep walls of the peneplain, to a height of 200 feet at least.

In the perfectly flat gravel-plain the stream winds from one side to the other, making typical ox-bow curves and exhibiting all the characteristics of a miniature Mississippi. Crescent-shaped lagoons and bogs which have previously formed part of the river-bed are of constant occurrence. The flood-plain is covered uniformly, except in places occupied by the river channel, with a black soil to a depth of five feet, and except where the peasants have cleared the ground for agriculture, a growth of fir and birch forest has sprung up. As many acres have been laid bare of trees, large tracts of the surface of the flood-plain are open to observation. It is interesting to note the succession of ridges—now, of course, grass-covered—in the form of large curves, hundreds of feet in length, nearly parallel to each other and to the present course of the stream. These ridges are successive banks of gravel thrown up on the inner side of the curve as the river at this point made larger and larger sweeps, cutting at each swing more deeply into its outer bank, extracting material to deposit further down its course. The greater part of this cutting and filling is undoubtedly done in the spring months, when the volume of this river, and of all those of which the Serebrana is a type, is greatly increased. Occasionally, in fact, the whole flood-plain is under water during the time of the breaking up of the ice and the melting of the snow. The covering of the gravel-plain with silt, forming a soil, and the consequent forest growth, is thus explained. Although the velocity of the stream averages two feet per second in the dry season, and must in the spring be considerably accelerated, yet it is likely that the actual eroding action of the stream at present is very small. Its energy is expended in transporting and retransporting hither and thither the gravel and silt encumbering its valley. The percentage

of this material actually carried out of its own valley into that of the Chusovaya must be an almost negligible quantity.

Not the least remarkable feature of the Serebrana valley is its shallow character. It has been well determined by pit-sinking in various parts of the flood-plain that from the surface of the soil down to the underlying rock the vertical section is but fifteen feet, and that the depth is remarkably uniform in all parts. Considering the fact that the valley occasionally reaches 2,000 feet in width, this lack of depth is extremely significant. It certainly points to the conclusion that much time has elapsed since the initiation of the present drainage. The small size, well water-worn and extremely uniform character of the pebbles, of which a large proportion are quartz, are evidence in the same line.

The description of the Serebrana river valley has been given with an amount of detail perhaps unwarranted by the tenor of the present article. The writer wishes to emphasize the fact, however, that the conditions here found are paralleled by hundreds of examples which might be cited, both in the Ural, along its entire length, and, with a difference only of scale, in Central and Eastern Siberia. Taking the Ural alone, however, it affords an example of remarkable uniformity of conditions extending over great areas. It is difficult to realize to-day, as one looks at the gently rolling steppe and the hills of insignificant height which compose the Ural, that here must have existed peaks as high at least as the Alps and the Sierra Nevada. Evidence afforded by the detritus of these mountains and by the various topographic conditions which have been referred to leaves scarcely room for doubt that the existing Urals are but the bases of mountains which were several times the height. From the facts set forth in this article, it appears to the writer a tenable opinion that the Ural is one of the oldest ranges, if not the oldest mountain range, to be found in those portions of the earth's surface known to scientific investigation.

CONDITIONS REQUISITE TO OUR SUCCESS IN THE PHILIPPINE ISLANDS.

AN ADDRESS DELIVERED BEFORE THE AMERICAN GEOGRAPHICAL SOCIETY, FEBRUARY 20, 1901.

BY

GEORGE F. BECKER.

A famous zoologist once said to me: "Human actions are determined to the extent of 90 per cent. by heredity, of 9 per cent. by environment, and only to the extent of 1 per cent. by free will." He spoke as an expert student of evolution. That I am not, but such observations as I have been able to make tend to confirm his paradoxical conclusion. Nations only partly resemble individuals, because in communities there is more or less open disagreement between the discordant elements which go to make up the whole. Yet of nations as well as of individuals it is true that under given conditions they will obey impulses which are in fact irresistible, though their action seems voluntary when superficially considered.

The United States has established itself in the Philippine Islands. The manner of their acquisition from the power which formerly owned them appeals to the imagination of the people of the Union. The opposition which the natives have made to our occupation of the islands has aroused the doggedness of our Teutonic race; and the task of developing the immense resources of the archipelago appeals most congenially to a nation descended from pioneers. The States of this Union will retain possession of the Philippines. The American people really could not give them up; for, as the colloquial phrase aptly puts it, we are not "built that way." To our retention of them there is great and even passionate opposition on the part of those who do not share in the national temperament. To gauge the efficacy of this opposition, fancy that the President were to send to Congress a message recommending our abandonment of the archipelago. The roar of protest which would then arise would be to the murmur now audible as a typhoon to a zephyr.

Thus, irrespective of individual opinions on the wisdom of acquiring territory in the Far East, it is reasonable that our people should turn their attention to a study of the ways and means by which our East Indian possession may be rendered tranquil and prosperous.

In such a study information is the first essential, for many misconceptions are current. Much that is true has been said or written of the Philippines and their inhabitants; but it requires knowledge and skill somewhat like an expert's to know whither to turn for the truth and how to discriminate it. I spent 14 months in various portions of the archipelago on a mission of inquiry, and that is my excuse for attempting to throw some light upon the beclouded way.

As is well known, the first inhabitants of the Philippines of whom traces now remain were the Negritos, a race of black dwarfs with customs marking the lowest stage of culture. As a rule they have no habitations, sleeping where night overtakes them. They use poisoned arrows, and it is said that most of them can count no more than 5. It is not equally well known that when the Spaniards first came in contact with them they all spoke a single language. Only a few Negritos now remain, in scattered bands, numbering, it is thought, some 25,000 in all. Politically they have no importance whatever. The Filipinos with whom we have to do are chiefly of Malay blood, somewhat admixed, to be sure, with that of other races, but still substantially Malay.* These people invaded the country from the southwest; wave after wave of incursionists reached the islands, much as the Danes and Saxons descended upon the British coasts, and with analogous results. Each fresh invading horde sought to conquer a region for itself, either from the Negritos or from preceding invaders. They must have come from various localities and have entertained little feeling of kinship for one another; for they spoke, as they still speak, many languages, all of them indeed of the Malay family, yet mutually unintelligible. More than 60 such languages still survive—the clearest evidence of past political disunion; 60 languages without counting dialects, in an area smaller than that of New Mexico. Nothing but persistent enmity and non-intercourse could have preserved such linguistic variety. Yet this by no means measures the political diversities which existed when Magellan discovered the Philippines. Among the Visayans who then spoke and still speak only one language, though numerous dialects, he found various communities openly hostile to one another, and it was in one of the petty wars between different bands of the Visayan tribe that the great Captain lost his life.

From the utter lack of culture represented by the Negritos upwards almost every age of civilization is represented in the Philippines. In eastern Mindanao a heathen tribe, called the Manobos,

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* In Mindanao there are some wild tribes of Indonesians, who have a larger share of Caucasian blood than the ordinary Malays.

practice ceremonial cannibalism and offer to their gods human sacrifices. In northern Luzón, too, there are head-hunting tribes, and some of these also have been accused of cannibalism, though, so far as I can discover, without sufficient proof. Even among the Visayas there seem to have been somewhat recently anthropophagous tribes. The Mohammedans stand on a considerably higher plane of culture than do the pagans, but their religion is said to be a very corrupt form of the faith of Islam, and they are at best semi-civilized. The Christian faith includes all the communities which can be called civilized, and a good many to which that term is applicable only by courtesy. Fortunately the Christian communities are far more populous than either of the others. No exact data exist, but it is supposed that about three-fourths of the population of the islands are Christian, and that they occupy about three-fifths of the territory. It is sometimes assumed that only the Christians of the archipelago need to be considered, because of the relatively small numbers of the unchristianized tribes; but this seems to me very doubtful. The pagans have been able to adhere to the faith of their fathers, a species of ancestor worship, because of their warlike character and the inaccessibility of the regions which they inhabit. As for the Moros, their holy law is a gospel of war, and it will be the easiest thing in the world to rouse them to fury. Thus far, however, they have shown a very friendly disposition to the United States, thanks to judicious treatment, initiated by General Bates.

That hostile feelings should exist between the pagans, the Mohammedans, and the Christians of the Philippines is at least very intelligible; but there are enmities also between Christian tribes. The Ilocanos, Pangasinanes, Pampangas, and Macabebes all detest the Tagalogs, who, indeed, are much disliked even by the relatively peaceful Visayans.

These facts are common knowledge, and it would not be worth while to state them here if they did not point to an inference which is as evident as it is important. There is no such thing as a Filipino people, and there never has been one since the Negritos were driven out of the choicer part of the country. The intertribal relations in the Philippines prior to their discovery by Magellan were very like those which prevailed until the last century among the North American Indians, and the diversity of language is, in the one case as in the other, a lasting evidence of the political chaos which existed. The only common bond between the Filipino tribes has been their partial or complete subjection to the Spanish Crown. Nothing but conquest will ever unify them.

That the Filipinos share with one another certain traits of character is certain, but the likeness is often exaggerated by observers new to the archipelago, who fail to discriminate the diversities included under the general type. The communities which make up the population of the Philippines bear no greater resemblance to one another than do the peasantries of Italy, Russia, Spain, and Germany. Temperament and customs divide them as well as language.

The vast majority of the Christian Filipinos are substantially illiterate peasants, who know little and care less about any tribe excepting that to which they belong, and who speak no other language than their own. I say they are substantially illiterate because, although many of them can read a little, practically the only books which exist in the native languages are elementary devotional tracts prepared by the priests. To this statement the Tagalog is a partial exception, a few volumes of poetry and other literature having been printed in that language. Yet those who read habitually or frequently read Spanish by preference, and not the native language. It fell to me to procure for General Otis a translation of his proclamation of January, 1899, into Tagalog. I found great difficulty in securing a trustworthy and orthodox version, for the most prominent natives of Manila, lawyers and physicians, and men of much culture, confessed to me that they possessed no critical knowledge of literary Tagalog, and read it with some difficulty. Away from the larger cities the Spaniards discouraged the aspirations of natives to master Spanish, and even a few miles from the capital it is often hard to find persons who understand that language. Mr. Aguinaldo himself speaks Spanish with difficulty, and ill. In fact, outside of a few of the largest towns, it is only among the higher officials and the capitalists that Spanish is spoken with ease, and these are thus the only persons to whom the news or the learning of the world is accessible. It is among these better-educated Filipinos that the warmest friends of the United States are to be found, men who have something at stake and who know something of the world.

These facts show that there is no such thing as public opinion in the Philippine Islands in the sense in which that term might be used of any homogeneous race, or of a community with a homogeneous civilization.

The revolutionary sentiments which have found such loud and, sometimes, eloquent expression originate with a very limited class, composed chiefly of Chinese *mestizos*, or mixed breeds. This cross constitutes a small but important element of the population. The

Chinese mestizo is the only half-breed in the world who considers himself very much superior to either of his parents. In truth, he is an intelligent and energetic man, and sometimes also a good one. Many of these mestizos, however, entertain the strongest antipathy to everything of European origin, and are extremely unscrupulous in their methods of pursuing their aims. They also overrate their ability in the conduct of public affairs. They have sought to establish an oligarchy in the Philippines, and in the attempt they have demonstrated, even to their own people, their administrative incapacity.

Gen. James Franklin Bell and I have a friend—a Filipino woman—who occupies a very responsible position in a large business establishment. She formerly had strong sympathy with the cause of "independence." Lately she has informed the General that she would rather see any government on earth assume charge of the Philippines, even the Chinese government, than take her chances under native rule, and this she has frankly been telling her countrymen. You may wonder that I quote a woman on such a subject, but ordinarily a Filipino woman is brighter than her husband, and I know of no other country where women exert an equal amount of influence. The experience of Negros in self-government is most instructive. I was on that island when the native government was organizing in May and June, 1899, with assistance, indeed, from the United States, but without any compulsion or interference. I even had a little to do with smoothing the way for the new administration at Damaguete, Negros Occidental, and thus came closely in contact with the leading officials. They seemed to me both well meaning and able. I thought they had a fair chance of success under our protection, and it was certainly a better chance than the natives could have enjoyed in any other Christian province. The attempt was a failure, however, and the Negrenos had to fall back upon the Americans and request them to organize and conduct a stable and orderly civil government. Englishmen of long residence even declare that the natives have too little respect for men of their own race to submit peaceably to them. It is difficult, perhaps impossible, to convey to any audience in this country the impression of political incapacity which the Filipinos produce on almost every one who is thrown intimately in contact with them for a considerable period. Any close observer finds among them a lack of the sense of responsibility and an absence of settled principles of action not dissimilar to those with which we are familiar among American boys in their teens. A community of our boys left wholly

to themselves, without guidance or restraint, would soon come to grief, while the same boys, properly advised, might do very creditably; and so may the Filipinos.

If the Philippines were to be left to themselves now, it is clear enough what would happen. War would break out at once in various directions. The Moros would not merely renew their piratical raids, suppressed less than half a century ago, but carry on an active propaganda for the faith at the point of the sword; instant conversion or instant death. The tribes of Luzón would not submit to Tagalog rule unless first conquered, and each petty chieftain of a guerrilla band would fight for his own band, hoping to emerge from the chaos as dictator of the country. Before absolute anarchy was attained, however, some strong power would step in and teach the Filipinos to weep for the departed Americans.

The insurrection of February 4, 1899, was not a surprise. The probability of such an outbreak had been evident for months, but it was hoped that better counsels would prevail in the native camp. Everything possible was done to avoid giving even specious provocation to the natives. Our military government and our men showed the utmost forbearance under gross provocation from the Filipinos. This I know from observation, and because I was in a position to learn officially all that went on. In fact, I was acting as first assistant in the Bureau of Military Information, and enjoyed the full confidence of my chief, Major Bell, now, for extraordinary merit, promoted Brigadier General. The attack took place on the evening of February 4. As fast as horses could get us there Major Bell and I made our way to the Nebraska line, where the first shot was fired, and we remained there, or on adjacent portions of the line, throughout the engagements of the night. The circumstances of the collision were investigated immediately, rigorously, and with full authority, only about half an hour after it occurred. The gallant Col. Stotsenburg (who died the finest of deaths a few weeks afterwards, at the head of his regiment) gave us full information with military frankness and terseness. So also did other officers, and there was no conflict of statement or opinion. I heard Major Bell dictate in the dark every word of his lucid dispatch on the subject to the Military Governor, the telegraph tent being under a fire so heavy that no light could be burned. It is superfluous to say that the account thus obtained-was precisely that given by General Otis in his dispatches and his annual report. The outbreak was a wanton and deliberate attack of the Insurgent forces on those of the United States, with no color of provocation on the part of the Nebraska regiment. The attempt

was made to force our sentry for the evident purpose of drawing his fire. He did simply his duty, not omitting due challenges before maintaining his post with the weapon entrusted to him for that very purpose. The Insurgents were only waiting for this signal and instantly responded with volleys.

Between our forbearance and the lies which their leaders had disseminated, the rank and file of the Insurgents really believed us cowards. They actually boasted before the outbreak that one Filipino could whip five Yankees, and they were confident that they should sweep us all into the bay that night. It is one of the many excellent traits of the Filipino that he despises cowardice. He is so old-fashioned as still to believe personal courage essential in the members of a ruling class. Hence, when once the impression had got abroad that Americans were cowards, quiet in the Philippines was impossible without a preliminary conflict. May the Filipino never lower his standard, or have cause to be disappointed in American bravery.

The insurrection in the Philippines has lasted much longer than most people thought probable. It is, indeed, almost impossible to free forecasts of future events from every tinge of hopefulness. Nearly all wars and insurrections have lasted longer than it was believed they would last. The Germans supposed the Franco-Prussian war at an end when the battle of Sedan had been fought; we thought trouble in the South over when Lee surrendered. In most cases the field of war is fertile enough to bear an aftermath which must be harvested. Our authorities, in forecasting the future, did not sufficiently count upon the sustaining effect of the support which the insurrection has received from a small but vociferous section of our own people. This was particularly thrust upon my attention, because I was ordered to read and report daily upon the newspapers published by Mr. Aguinaldo's adherents, and these were full of it. The natives frankly told me eighteen months ago that they proposed to fight on till the fall elections, and if those should go against their partisans, they would try to hold out till the Presidential election. This has turned out to be true. Organized opposition, in any proper military sense, ended a year ago; but irregular warfare has continued, and made long casualty lists. Some people refuse to believe that anti-imperialism has really stimulated the opposition of the Filipinos; yet it has done so beyond a peradventure, and the fact is perfectly explicable to any one who is in the least familiar with the conditions. The Filipinos are entirely unaccustomed to free speech, and the abuses of which it is capable. To

their minds the fact that diatribes against the Government could be printed in this country, was conclusive evidence that the party in power was at the point of collapse and unable to suppress attacks. The anti-imperialistic agitation has been hard on the American soldier, and harder still on the Filipino; but it has had its peculiar advantages, for it has enabled a number of gentlemen to demonstrate to their own satisfaction how much holier they are than their fellow-citizens. They have built about themselves shrines of skulls.

The insurrection, however, might have been ended earlier in spite of American support. From a purely military point of view, greater severity would have been advantageous. Had the laws of war been rigidly enforced, had prisoners been closely interned, had spies and those who violated parole been promptly shot, there is every reason to believe that opposition would have been crushed out ere this. I am very glad it has been otherwise. No war in the world was ever waged so humanely and magnanimously as we have conducted this. Furthermore, I have, from most excellent sources, information that the Filipinos appreciate this fact. Thanks to the mildness of our commanding generals, when peace is at last fully established there will be no residual bitterness and hatred to overcome. The Filipinos do not hate us now, and if we treat them under civil government with as much fairness and generosity as the army has shown them, they will be and remain loyal subjects of the Union.

The average native has long been sick of war and ready for peace. Wonder is often expressed that, if this be true, there is not an apparent reaction in our favor. But this is not strange at all. Only the Americans and the Insurgents possess firearms. Under Spanish rule natives were not permitted to have them, and the insurgents have found great difficulty in procuring even the limited number now in their hands. A native not permanently resident in a garrisoned town, who is known to be in sympathy with the Americans, is thus completely at the mercy of the Insurgents. Furthermore, though as a rule, to which there have been some exceptions, the hostile Indians have treated American prisoners with humanity, they are merciless to natives believed to oppose the insurrection. Prudent native sympathizers with the United States have therefore awaited the cessation of hostilities.

The Administration and the commanding officers of our military services have been pitilessly criticised for their alleged blunders. It would seem, indeed, according to the critics, that our leaders

are so phenomenally perverse as never by any chance to do right or well. The assumption is constantly made that there has been some possible plan of action in the Philippines attended by no inconveniences or drawbacks. There never has been a complex transaction which would not have gone off more smoothly had the responsible leaders been gifted with supernatural foresight. This the critics of the national policy certainly are not, and I do not believe that any set of men exist who could have conducted affairs in the Philippine Islands with fewer or less important mistakes than have been made. Had we returned Manila to the Spaniards, or abandoned the islands to Mr. Aguinaldo, or sold them to a European power, the sum of human misery involved would have been far greater than it has been, even without reckoning the humiliation which such a policy would have entailed upon the people of these forty-five United States. A conflict with the natives was inevitable from the start, though at first we did not know it, and had no means of ascertaining it. It has been conducted on what a very few military critics scoff at as "the lovey-dovey system," a system of which we have every reason to be proud. It is the system consistently favored by our generals, and which has been loyally carried out by their subordinates, even those who took a more purely military view of the best policy.

The officers of our united services have acquitted themselves with all possible credit. No military glory of the highest order, to be sure, is obtainable in a war with semi-civilized peoples, for the most brilliant feats of strategy do not enter into such a contest. But the finest tactical ability has been shown, and admirable efficiency, accompanied by inexhaustible courage. Nearly as important has been the adaptability displayed by our officers, and their simple-minded devotion to any duty, whether technically military or not. No one but the few who have seen it will ever appreciate the tact and good judgment manifested by officers of our army in keeping order in Filipino communities, where mildness was essential and the exercise of arbitrary power indispensable. Nothing but genius or careful training suffices to teach men the skilful and humane use of arbitrary power. To this an officer in either service is educated from boyhood, and, as far as opportunity offered, the officers of the navy, including the lieutenants in command of vessels of the mosquito fleet, have demonstrated the value of this training, as well as the officers of the army. It is time now to introduce civil government in portions of the archipelago, but I trust that a goodly share of the offices may be temporarily filled by military

officers, and that the civilians associated with them may study their methods of using, without abusing, power.

Some people fear the growth of the army and of the military spirit in this country. They must be thinking of a military spirit very different, indeed, from that which prevails in our services. There is not in the United States or in its territories and dependencies any body of men which compares with the officers of our army and navy in the combination of qualities they display—upright and intelligent devotion to duty, appreciation of the rights and liberties of American citizens, and thorough-going patriotism. Why, if the people would only study it and profit by it, the cost of the army would be repaid by the object-lesson it affords in merely civic virtues! Our military forces have earned in the Philippines all the credit which the situation made possible. Furthermore, they have kept the flag clean. I do not mean to assert that no individual on the rolls or the roster of the army of the United States has done anything discreditable. The entire suppression of crime and misdemeanor has never been accomplished in any populous community, civil or military. But the criminal acts of individuals committed in contravention of orders no more defile the Stars and Stripes than the rabid assertions of slanderous writers concerning the "pollution" of the flag befoul anything except their own reputations and environment.

Peace seems to be approaching in the archipelago, and the questions which will soon press for solution are many. How are we to let in upon the Filipino tribes the light of our own civilization, the best we have, be it absolutely good or bad? Our own experience answers the question—roads and schools. Wagon-roads, trolleys, and railroads, must be built as fast as possible, either at public expense or, better, on franchises carefully guarded against monopoly. Primary schools and grammar schools must be started everywhere, with instruction for all the higher grades in the English language from the moment when the children are able to comprehend sentences in our own tongue. For higher instruction let the Filipinos be encouraged and assisted to come to the United States, in order that they may learn our manner of life as well as our books. They already manifest a desire to do so by sending young men to our schools, and the more that come the better for them and for us.

The lands of the religious orders ought clearly to be purchased. Only so can treaty obligations be observed and a source of grievous irritation in Filipino communities be removed. It seems to me

the true policy for the United States to buy these properties, the cost to be reimbursed by the government of the Philippines gradually, and from the revenues obtained from the lands. Mr. John R. Proctor aptly suggests the application to these lands and to the entire public domain in the Philippines, of the system of government leases, in part perpetual, which is meeting with such brilliant success in New Zealand. It does away with all disputes as to title, and absolutely bars the accumulation of holdings acquired for the sake of an "unearned increment."

Laws and regulations governing the Philippines require most delicate handling and a thorough knowledge of the conditions. The fiscal policy suitable to, or popular in, the States would not be adapted, at least for the present, to the needs of our Asiatic possessions. The Philippines are and must ever remain chiefly agricultural; and, although factories will spring up in time, our first object should be to foster much-needed prosperity on the industrial lines to which the people is wonted. For the present they should have a tariff for revenue only, and if industries there are ever to be protected, taxes for that purpose should be introduced very cautiously, with consideration for the people as a whole.

The great diversity in temperament, religion, and civilization among various tribes also makes it essential that the government of the Philippines should have, under due but not excessive checks, a free hand in framing laws. A holy war with Mahommedans is always a formidable matter, because it is the ambition of the followers of the prophet to die on the field of battle. It is also easy in mere ignorance to give offence to Mahommedans which they will regard as a *casus belli*. With their religion we have nothing to do. It may be possible by diplomatic treatment to keep at peace with them and to procure the abolition among them of the mild form of servitude which they maintain, something utterly different from slavery as we are accustomed to think of it, and resembling rather the feudal system of Europe in the Middle Ages. The pagan Igorrotes, Irayas, Manobos, and many other tribes will require very different treatment each from the other and all from the Moros. It will be an immense job, requiring all the ability and nerve of our own best young men as local advisory residents or as provincial governors for its successful accomplishment, as well as free and steady hands at the helm in Manila. Not only our own men but our women also in the Philippines should be fully occupied in public affairs. As I have said, the Filipino women are both intelligent and influential. They can be most easily reached through our own women, who

should seek to gain their confidence and to exert themselves systematically for the good of both races.

By all means let Congress enact only the most indispensable laws, defining the relations of the Manila government to the suzerain. Give the Philippines a territorial charter, but one in which freedom of action is secured to the responsible officials representing the Home Government, a freedom corresponding to the responsibility which only they can adequately sustain.

Above all things, let every decent man see to it that merit, merit only, shall control the selection of American officials charged with fostering the civilization and development of the youthful people with whose wellbeing we have charged ourselves. When an American community is ill-governed I care little. The remedy is always in the hands of the members of the community, and if they are so supine, or so busy with their private affairs, as to submit to extortion or ill-treatment, they deserve what they get, and the more they smart for their neglect the sooner they will be aroused. With a dependent or less competent people it is far otherwise. All the millions stolen by the Tweed ring are of trifling importance compared with the few score thousands shamefully peculated in Cuba by officials of the Post Office Department. The pillory and the whipping-post are too good for such scoundrels. The very essence and gist of our success in the Philippines is to send to them as representatives of the United States our cleanest, most intelligent, and ablest men; men who recognize that the highest destiny which can possibly fall to the lot of a real man is to serve his country honorably and successfully. The Philippine Commission contains men of the right stamp, and the Administration is striving to adhere to the merit system in its selection of other officials.

Let us, the public, see to it that honorable and able service meets with due appreciation, while vilification is reserved for evildoers, and it will soon become the fashion for honorably ambitious youths to seek service in the Philippines. Then will the reflex action on our own body politic reward us for all the trouble and anxiety the archipelago has cost us, and we shall turn with delight to the contemplation of a prosperous and loyal Philippine community, at last and for the first time a real Filipino people, making full use of the fairest area among the possessions of the United States.

MOUNTAIN PASSES: A STUDY IN ANTHROPOGEOGRAPHY.

BY

ELLEN CHURCHILL SEMPLE.

Mountains influence the life of the people dwelling in and near them fundamentally, but variously. To one slope they give perhaps an abundant rainfall, to the other they show a cloudless sky and yield only from their melting snows a scanty supply of water. The Himalayas are flanked by the teeming population of India and the sparse nomadic tribes of Tibet. Mountains draw just such clear-cut lines of contrast in temperature. The Scandinavian range gives to Norway the warm, soft air of the Gulf Stream, while a hundred feet below the water-shed on the eastern side Sweden feels all the rigor of a sub-frigid climate. An upland system may offer broad, fertile valleys for cultivation, like the Valley of Virginia; or it may present only narrow gorges of erosion, as in eastern Tennessee and Kentucky, restricting agriculture and condemning the whole region to poverty and isolation; or it may in effect prohibit agriculture, if situated in high latitudes, where the timber-line drops well below the crest, and may force its inhabitants to the semi-nomadic life of shepherds, as in Norway and in some parts of Switzerland, where the summer pasture lands on the heights support the flocks and herds; or mountains may promote the rapid development of a people by great mineral resources, as in the Harz, the Rockies, and the western Alleghanies. These influences are some beneficent and some deleterious, always varied. But in one respect mountains always play the same big part in history. They are always barriers, always obstacles, more or less difficult to surmount, and, therefore, always a challenge to the energies of man. Their beauty, the charm of the unknown beyond, tempts the enterprising spirit; but the hardships and dangers they present daunt or baffle the mediocre, while by the great ones of the race who succeed is found beyond a prize of victory. Such were Hannibal and Napoleon and Jenghiz Khan and those lesser heroes of the modern work-a-day world who toiled across the Rockies in the feverish days of '49, or who faced the snowfields of Chilkoot Pass for the frozen gold fields of the Yukon.

For migrating, warring, and trading humanity, therefore, the

interest of the mountains is centred in the passes. These are only dents or depressions in the great uplifted crest, or gaps carved out by streams, or breaches in the mountain wall; but they point the easiest pathway to the ultramontane country, and for this reason become the focus of all the great highways on either slope, as well as of the side valleys within the mountains themselves. Their influence is far-reaching. The Brenner, in the eastern Alps, by its continental trade in the Middle Ages, made the greatness of Augsburg, Ratisbon, Nuremberg and Leipzig to the north, and promoted the growth of Venice in the south. The Khaibar Pass, in northern India, and the Gates of Herat, in western Afghanistan, are never lost sight of by the British and Russian Governments in formulating their Asiatic policy. Passes never become insignificant, are never unused except when the deep cover of winter snow temporarily renders travel impossible They are nature-made thoroughfares, traversed now by the undisciplined hordes of migrating barbarians, now by the organized army of the conqueror, now by the woolly flocks and guardian dogs of the nomad pastor, now by the sumpter mules of the itinerant merchant, now by the engine toiling up the steep grade with its heavy train. Nowhere else does history repeat itself so monotonously and yet so interestingly as in mountain passes.

Mountain ranges form in general great natural cleavage lines of drainage basins, of flora, fauna, races, population, commerce, and consequently of nationality and political dominion. Most of the history of central Europe since the time of Charlemagne has meant the slow evolution of the scientific boundaries of the modern States formerly embraced in his great empire, along the mountain ranges marking their natural frontiers. The latest step was taken in 1871, when the nascent German Empire drew its frontier along the Vosges crest instead of in the valley of the Rhine. All the States in the upland part of the continent have one or more mountain boundaries. Five States abut upon the Alps. The Vosges, the Alps, the Böhmer Wald, the Riesen and the Erz ranges form the highland frontiers of Germany. Even in our own republic, where State boundaries count for little, "the mountainous back-yards of nine states," as a recent writer picturesquely expresses it, extend up into the lofty ridges of the Appalachian system.

Besides forming natural frontiers, mountains serve as border defences, and for this reason, too, recommend themselves as political boundaries. The effectiveness of such defence depends upon the character of a range as a barrier. This in turn is determined

by the height, length, width, form, and location of the mountains themselves and the passes that traverse them. The Tian-Shan mountains, with a length of twelve hundred miles and a mean width of two hundred and forty miles, raise a wall 16,000 feet high across Central Asia in which there are almost no gaps except near the eastern and western extremities. The Pyrenees, the Caucasus, the Scandinavian system, and the Andes, on account of the scarcity and great elevation of their passes, have always acted as great barriers. Epirus and Ætolia, fenced in by the solid Pindus range, took little part in the common life of ancient Greece; but Thessaly, with its intermittent chains, was a passway between Macedon and Hellas. The Hindu-Kush, from the Pamir to the Pass of Bamian northwest of Kabul, forms a crescent a hundred and twenty miles long, in which there are at least twenty gaps, varying in height from 11,000 to 15,000 feet and sometimes accessible to caravans of camels. These mountains, therefore, in spite of their height, presented open doors to the succession of invaders who left Turan and Iran for the fertile plains of the Indus. The passes in the Suleiman Mountains along the Indo-Afghan frontier number two hundred and eighty-nine, every one capable of being traversed by camels; and in the continuation of the range along the borders of Baluchistan there are seventy-five more. An enemy's army stationed at Kandahar would command most of these passes; hence the importance of Kandahar to British India. The Alps have an astonishing number of excellent passes, for the most part evenly distributed, so that it is possible to traverse the system from one side to another in any direction. The Appalachian system is some three hundred miles in width and thirteen hundred miles in length; but there are excellent gaps in the linear arrangement of its parallel chains, which afforded natural, though circuitous, highways to the early winners of the West. The disposition of the passes is such that, one range penetrated, the next presents a similar barrier, so that the longitudinal valleys in between have to be traversed before another opening can be found. The pioneer who started across the mountains from Virginia could come out on the slopes of the Cumberland Plateau either by way of the Kanawha River to the Ohio, or down the valley of the Holston, through Big Moccasin Gap, Big Stone Gap, and Cumberland Gap, into southeastern Kentucky.

The Appalachian system could also be avoided by making a long detour to the south, where the mountains run out into low hills in the eastern Gulf States; but where a range extends down to the ocean, like the Alps, or reaches from sea to sea, like the Pyrenees,

the Caucasus and the Grampian Hills of Scotland, its blockading character is enhanced, especially for military purposes and in a primitive stage of civilization, before the achievement of maritime development. The Caucasus was a barrier to most of the migrating peoples of antiquity. The Romans never got across them. The Persians only temporarily forced a wedge of conquest along the Caspian shore. Mountains thus located develop a few geographical conditions peculiar to themselves. As a rule, at one or both extremities they sink to meet the flanking seas; and here, between upland and water, they may afford a natural highway only a little above ocean-level. The Pyrenees are crossed by only two railroads between France and Spain, the Bayonne-Burgos line along the shore of the Bay of Biscay, and the Narbonne-Barcelona line, overlooking the Mediterranean. Between these two extremities there are only two practical passes for carriages—the Col de la Perche, between the valley of the Tet and the valley of the upper Segre, and the Port de Canfranc, on the old Roman road from Saragossa to Oloron.

Some mountains thus located offer a pass at one extremity, but at the other drop off abruptly into the sea. The Pass of Derbent, or the *Pylæ Albaniæ*, as it was called by the ancients, lies between the Caspian and the last offshoots of the Caucasus, and in all ages has been the highway for the peoples entering Persia and Georgia from the north. The Russian railroad from Rostov, at the mouth of the Don, on the Sea of Azov, to Poti, on the Black Sea, runs along the northern base of the Caucasus to Derbent, where it follows the pass between mountains and sea to Baku; here it doubles the eastern end of the Caucasus and follows the valley of the Kur westward to Poti. The western shore of the Caucasus daunts the Russian road-makers to-day; and in antiquity the retreat of Mithridates along this wild coast, when driven out of his kingdom by the victorious legions of Pompey, was considered one of the marvels of the age. We see the same contrast between the eastern and western Highlands of Scotland; one of the two railroads running north and south through the country hugs the eastern shore. Even in Greece, where the arrangement of the mountains is much more complex, the Pass of Thermopylæ again is on the eastern rim.

For purposes of trade these intermarine mountains offer a less effective barrier, because they can be avoided by an easier and cheaper sea route. Hence on each side of such ranges we find active seaports develop, like Narbonne and Barcelona, Bayonne and Bilbao, with Santander; the Azov ports and Poti, with Trebizond,

on the Black Sea; Petrovsk and Baku on the Caspian. Analogous is the position of Marseilles and Genoa in relation to the Maritime Alps. In time of war such ports are always the object of attack by the invading force, because they can be made the base for military and commissary supplies. In the Peninsular War almost the first act of the French was to seize Barcelona, San Sebastian, and Bilbao; and throughout the seven years of the conflict these points were the centre of battle and blockade and siege. If Russia ever undertakes to acquire the upper Euphrates valley from Turkey, Trebizond will repeat the history of Barcelona in the Peninsular War.

In plains and valleys highways may be built arbitrarily, bending to north or south, east or west, as expediency suggests; but in mountain regions the passes dictate the route of the thoroughfare. In the highest ranges there is no appeal from this; but in the lower systems, especially in those old mountains which have been rounded and lowered by the action of time, economic and sociological considerations may in some instances be of greater moment than orographical conditions in determining the location of highways. Nevertheless, the law holds good that the pass points the road. In the eastern Tian-Shan, where the range reaches only 10,000 feet elevation, the passes are 9,000 feet high; and in the western portion of the system, where the crest is 16,000 feet high, the passes are from 11,500 feet to 13,100 feet high, so that the range preserves everywhere its wall-like character. It has, therefore, determined the routes of two great historic highways from China to Bukhara and Samarkand. These roads diverge at the town of Chami or Hami (elevation, 2,700 feet), on the northern edge of the Gobi Desert. One, now the imperial road, leads north across the Kosheti-Davan Pass (9,100 feet) to Barkul, thence along the base of the range westward by Kulja and the Ili River, and over western offshoots of the Alatau range to Tashkent. This was the route followed by the Mongol and Tartar hordes in the thirteenth century, and was even then a great commercial highway. The other runs almost parallel with this one, directly west, along the southern base of the Tian-Shan for almost a thousand miles up the Tarim basin to Kashgar, and above this city it leads by the high passes between the Tian-Shan and Alai, or over the northern Pamir, to the head streams of the Syr-Daria and the Oxus. The Bukhara-Samarkand railroad has recently been extended by Russia northeastward from Khojent to Andijan (1,400 feet), whence trade can move over the Terek-Daban Pass (12,200 feet) and connect with this second route at Kashgar. All the western approaches to the northern route

Russia already controls by her possession of the district between Lake Balkash and the Tian-Shan.

On another great upheaved area in this vicinity Russia has also made good her claims; but the Pamir, despite the great height of its passes—in consequence of its character as the focus of five great radiating mountain systems—assumes a different anthropogeographical aspect. The Pamir has an estimated area of 30,000 square miles. It rises 13,000 feet above the plains of Turkistan, and is limited on the north, south, and southeast by ranges that tower eight or ten thousand feet higher. Moreover, the plateau itself is traversed by minor ridges, which rise two or three thousand feet above its surface, and between which the streams drain east and west without any well-defined watershed. This topography lends to the whole Pamir the character of a great pass area. From its summit or its slopes drain four great rivers of Asia—the Syr-Daria, the Oxus, the Tarim, and the northern tributaries of the Indus. Only the last river, however, reaches the ocean. These streams form natural avenues of approach. On the surface of the plateau the transverse ridges present no serious obstacles, and the valley routes between can almost be compared to artificial highways. More than this, the Pamir is a famous pasture land, and the grass grows as thick in some places as in the grazing grounds of Western Europe. The nomad Kirghiz shepherds bring their flocks and herds up here to fatten in the summer, and travellers, from Marco Polo's day to the present, have found here a regular supply of fodder for their pack animals.

For all these reasons, in spite of the great elevation of its passes (varying from 13,400 feet to 15,100 feet), the Pamir has been a great highway from the west to the east since the earliest times. It has been traversed by Greeks, Romans, Arabs, Italians, and Chinese; by traders, pilgrims, missionaries, explorers, and even by light columns of troops. The particular route followed by the early Greek traders, as indicated by Ptolemy, probably led from Bactria through the upper Oxus valley, and across the southern portion of the Pamir down to Kashgaria. Marco Polo followed about this route and descended to Yarkand in the Tarim basin, whence he skirted the desert of Gobi on the south and entered China proper by the headwaters of the Hoang-ho. In the tenth century, large Chinese caravans from "Serica," or the "Land of Silk," moved regularly up the Tarim basin and across the passes at the northeast corner of the Pamir to the sources of the Syr and the Oxus. Russia, with an eye to the possibilities of the Pamir,

annexed almost the whole of its area in 1886 to the administrative government of Bukhara.

An important question in connection with mountain passes is the difference in the grade and length of the slope approaching them. Rarely does the crest of a system divide it symmetrically. This means a steep, difficult approach to the summit from one direction, and a more gradual, and hence easier, ascent from the other. The country commanding the easy approach has in time of war a better chance to surprise the ultra-montane enemy by a sudden and swift descent from the dividing ridge, and can command a long line of successive points of supplies connecting with its real military base in the plains. For instance, if Russia and England should come into conflict along the Hindu-Kush and the southern Pamir, England's military base would be at Peshawar (1,160 feet), and the distance from here to her outpost at Fort Chitral (7,100 feet), at the southern foot of the Hindu-Kush, is 120 geographical miles as the crow flies. Russia's outpost, just across the Hindu-Kush wall from Fort Chitral, is Ishkashim (8,700 feet); her main military base would be at Bukhara (640 feet), her nearest railroad point, which is distant six hundred miles by the air line; but the long, slowly ascending valley of the Oxus would afford her an easy avenue of approach, while the towns and villages of upper Bukhara, with more abundant water than the cities of the Turkistan plains, can furnish adequate supplies up to the very edge of the Pamir. The problem of commissary and transportation is simpler for the Russians than for the English on the steep southern slope. The same contrast of slopes is seen in the Alps. The drop from the Brenner Pass to Munich is 2,800 feet, and to Rovereto, an equally distant point on the southern side, the road descends 3,770 feet. The political boundary of France, following closely the crest of the Alps from Lake Geneva to the Mediterranean, brings over two-thirds of the upheaved area within the domain of France, and gives to that country great advantages of approach to the Alpine passes over Italy. It is a matter of history, from the days of Hannibal down to the present, that the campaigns over the Alps from the north have succeeded, while those from the south have miscarried.

The Kirghiz nomads who frequent the highlands of central Asia from the Tian-Shan to the Hindu-Kush for the summer pasturage are authorities on mountain passes; they distinguish four different kinds, for which they have four Tartar names. The *daban* or *davan* is a rocky, difficult defile; the *art*, a dangerous gap at high elevation; the *bel* is a low, easy pass; and the *kutal* is a broad open-

ing between low hills. As a bit of anthropogeography this nicety of discrimination suggests the twenty-one words for tints and shades of gray of the Samoyedes of Arctic Siberia. Though without this elaborate terminology, we yet distinguish as many varieties of passes. As a pass points a highway, the form most easily traversed is the one that plays the greatest part in history. Such a form is found in an almost complete break or dip of a mountain system. The natural depression of the Hudson and Mohawk valleys, only a hundred and seventy-five feet above sea-level, is the only decided break in the whole length of the Appalachians; this fact, together with its ready accessibility, made it an important factor in the history of the early colonies, as well as in the later history of New York. It was the natural route of communication with the Great Lakes, and enabled the colonists to tap the fur trade of the north-west, then in the hands of the French. Furthermore, trails from the Mohawk and Genesee to the Alleghany connected this depression with the Ohio and Mississippi, then claimed by the French. So, when the French and English came into conflict for supremacy in the New World, the Mohawk and Hudson valleys were their battle-ground, determined by the geography of eastern America. In later days this depression rendered possible the Erie Canal, and the greatness of New York City; and in the not remote future, when the Erie Canal is deepened, it will connect the proposed steel works on Staten Island with the ore-fields of the Mesaba Range.

An exact parallel to the Mohawk route is afforded by the Gap of Belfort. This is a low pass, twenty-five miles wide, between the Vosges Mountains and the Alps system, here called the Swiss Jura. Connecting, as it does, the long valleys of the Rhone and the Rhine, it has been the great historic route of trade and travel between the North Sea and the Mediterranean from the days of the ancient Etruscan merchants to the present. This was the route of the invading Teuton hordes, and later of the Germans under Ariovistus, when they tried to occupy Gaul; and it was near Mühlhausen, in upper Alsace, that Cæsar defeated that chieftain. Four centuries later came the Alamannians, and, though defeated at Strassburg by the Emperor Julian, by this route they subsequently passed over into Alsace. It is the strategic key to central Europe, and was recognized as such in 1870 when the Germans massed their forces to invade France. It is traversed to-day by railroads to Paris and Lyons, and by a canal from Montbéliard to Mühlhausen and Basel, connecting the Doubs and the Rhine. A similar pass is to be

found in the famous "Gates of Herat." The Hindu-Kush Mountains run off in the northwestern corner of Afghanistan, just north of Herat, into a ridge of low, grassy downs not more that nine hundred feet above the surrounding country, and through them flows the Heri-rud on its course from the plateau of Herat (2,600 feet) down to the low plains of Russian Turkistan.

Another order of pass, but allied to the last in its low elevation, is represented by the Brenner, which is a deep saddle in the eastern Alps, joining the Inn and Adige valleys. It is 4,460 feet above the sea, but only 2,760 feet above the foot of the pass where the Inn flows out into the Bavarian plateau, and thus forms the lowest line of communication across the Great Alps. The Brenner was the route by which the Cimbri came into the valley of the Po, and by which at a later date the Romans communicated with their possessions on the Danube and the upper Rhine. It was the road by which in the Middle Ages the armies of the German Emperor came to make good his claim on Italy. Through this gap Austria thrust her strong arm to keep her hold on the plains of Lombardy. By this road came the artists and artisans of the north country to learn the arts and crafts of beauty-loving Venice. From the Roman road-makers to the present railroad engineer, with all the concomitant civilization of each, the Brenner has seen the march of human progress. The Austrian Alps further east, dropping to a lower altitude while the ranges spread out, are crossed by many passes of slight elevation, like the Semmering (3,200 feet), through which was built in 1854 the first railroad over the Alps. These passes determined Rome's expansion to the Danube, just as later they exposed her to the inroads of the Goths and Huns.

Passes that reach a higher altitude than the Brenner can, for all practical purposes, be grouped together, though they may be distinguished in certain minor details of anthropogeographical interest. The Barogil Pass (12,000 feet), leading from the headwaters of the Chitral River over the Hindu-Kush to the Pamir, is a grassy plain, whither the nomads of the upper Oxus come to graze their cattle, and, according to one traveller, it might be crossed in a wheel wagon. The summit of the Little St. Bernard (7,420 feet), one of the easiest and earliest-known passes of the western Alps, is a pasturage plain three miles long. A circle of stones here is supposed to mark the place of a council of war held by Hannibal while waiting for the stragglers to come up. By contrast, the Brèche de Roland (9,337 feet), in the Pyrenees, is a great portal, only 300 feet wide, in a ridge of rock forming the boundary between France and

Spain. Legend says it was cut through by Roland's sword, Durandal, to open a passage in pursuit of the Moors. And in far-away Persia we hear of the Shamsher bur Pass, or "Sword-hewn," held sacred as the work of Ali's sword, and one of the oldest and most frequented routes of northern Media.

When a mountain system consists of a single narrow range, it can be traversed by a single pass, like the Pass of Dariel over the Great Caucasus, or the Pass of Canfranc over the central Pyrenees. The same result follows where the summits of broader mountains also are approached by long, transverse erosion valleys which have been cut out from the heart of the system. The western Alps are completely dissected on the French side by the Durance, Drac, and Isère, so that the ridge of the system has to be traversed only at one point. In consequence of the ready accessibility of this range there were four established routes here in the days of the Roman Empire: I. The *Via Aurelia*, between the Maritime Alps and the sea. II. The *Mons Matrona* (Mont Genèvre, 4,100 feet), between the head stream of the Dora Riparia and that of the Durance, which was the best highway for armies. III. The Little St Bernard, from Aosta, on the Dora Baltea, over to the Isère and down to Lugdunum (Lyons). IV. The Great St. Bernard route, which led northward from Aosta (*Augusta Prætoria*) over *Mons Penninus* to *Octodurus*, at the elbow of the upper Rhone, where Martigny now stands. In the central Alps the Romans used only the Brenner route, which, like the others mentioned, surmounted the Alps at a single pass and formed the ancient line of communication with *Augusta Vindelicorum* (Augsburg). They seem not to have known the St. Gothard, which, though higher than the others, is the summit of an unbroken ascent from Lago Maggiore up the valley of the Ticino on one side, and from Lake Lucerne up the Reuss on the other.

Mountains which spread out on a broad base with a succession of parallel ranges, and through which no long transverse valleys afford ready transit, must be crossed by a succession of passes determining more or less circuitous routes. The central Alps fall into such parallel ranges, divided by the longitudinal valleys of the Upper Rhone and Upper Rhine. Only by the great central dome of the St. Gothard, analogous to the Pamir, can they be crossed by one pass. Everywhere else the northern range must be crossed by some minor pass like the Gemmi (7,553 feet), or Panixer (7,907 feet), to the longitudinal valleys, and the southern range again by the Simplon (6,595 feet), San Bernardino (6,768 feet), Splügen (6,946 feet), or Septimer (7,582 feet), to the southern slope. The old

route from Augsburg to Milan followed the valley of the Lech south to the Kalk Alps, which it crossed by the Fern Pass to the valley of the Upper Inn, then led up this valley to the eastern boundary of the Grisons, where it turned south and by the Reschen-Scheideck (4,898 feet) crossed the central Alps; finally it traversed the southern Alps, by the Stilfser Joch, to the valley of the Adda and Lake Como. More circuitous still are the routes through the Austrian Alps, or the caravan road from Peshawar, in the Punjab, over the countless ranges of the Hindu-Kush to Balkh, in the plains of northern Afghanistan. The route leads through the Khaibar Pass, then along the gorges of the Kabul river, crossing several minor ranges, to the city of Kabul (5,740 feet); then by the Unai Pass over the Paghman mountains into the valley of the Hilmend River, over the main range of the Hindu-Kush by the Hajikhak Pass (12,000 feet), or famous Gates of Bamian, from Bamian north by the Ak Robat to the Khulm river, which it follows down to the trading points on the Bukhara frontier. This road presents so many difficulties that caravans from Turkistan to India prefer another route up the valley of the Heri-rud to Herat, thence diagonally southeast across Afghanistan to Kandahar, and thence by the Bolan Pass southeast to the Sind. The successive ranges of the southern Appalachians necessitate a circuitous journey in crossing them; but their passes are in general broad, flaring water-gaps, resulting from the peculiar geodetic history of this section, and their spacious intermontane valleys afford natural highways, so that after the feet of the first pioneer had beaten a track over the eastern ranges, and Daniel Boone had blazed the Wilderness Road from Cumberland Gap to central Kentucky, the Appalachians presented no very serious barrier to the frontiersman.

Quite as important to communication as pass or gap, therefore, is the question of the avenue of approach to the same. This the transverse erosion valleys of mountains have always furnished. The stream determines the highway leading to the pass, and the length of the stream, generally speaking, determines the importance of the road. The passes in the Alps which are approached by deep reentrant valleys are those that are crossed by railroads to-day: Mont Cenis, St. Gothard, and Brenner. The Canadian Pacific Railroad, utilizing such transverse valleys, runs from Vancouver eastward up the cañon of the Fraser river across the Cascade Range; then up the cañon of its tributary, the Thompson river, to Eagle Pass over the Gold Range; then up the Kicking Horse cañon to Kicking Horse Pass (5,240 feet), by which it crosses the Selkirk Rockies,

and then drops to the plains down the gorge of Bow river. The Northern Pacific Railroad uses the upper Missouri in western Montana in its ascent of the Rockies, and the Columbia for its passage through the Cascade Range. The Columbia and the Fraser cañons are not transverse valleys in quite the same physiographical sense as the others mentioned, but these rivers, like the Danube at the Iron Gate, sawed their way through a nascent mountain range as it slowly protruded its ridge.

But the regular transverse valley is the route from summit to plain, where it connects with a pass. The passes themselves have only emergency inhabitants—the monks and dogs of the hospice, the road-keepers in their refuge huts or *cantoniere*, or the garrison of a frontier fort or military colony, as in the Roman days, to hold these important thoroughfares. The flanking valleys of approach draw to themselves all the active life of the mountains. Here are concentrated commerce, population, and what scanty resources the barren upland may furnish. Their settlements have a similarity of location and physiognomy. Especially is this true of routes where there is no railroad line, and where no carriage-road has been constructed over the summit. The Alpine passes have gone beyond this stage of development, which, however, predominates in the Pyrenees. In the upper part of the valley, where the carriage-road ends and where the mule-path or foot-trail begins, we find a small settlement. Here the traveller can spend the night, rest his animal, and supply himself with what is necessary for the long, final ascent to the summit. Such places are Andermatt and Airolo on the St. Gothard route, Chamouni on the Tête Noire, Courmayeur, and a dozen others well known to the tourist in Switzerland.

A little further down the valley the type changes. Here the main valley develops a point where side valleys converge, each one of which in turn may lead to passes. Such a point necessarily becomes a focus of life and of trade, because it is a natural distributing centre for commodities destined for the highland inhabitants. Chiavenna, at an altitude of 1,090 feet, is situated just above the head of Lake Como at the junction of the Mera and Liro valleys, the first of which leads north by the Splügen Pass to the Hinter Rhine, and the second east by the Maloja Pass (5,940 feet) to the headwaters of the Inn just above St. Moritz. The town has a population of about 4,000. Such a point is Aosta (1,913 feet), on the Dora Baltea, in northwestern Italy. It controls the great St. Bernard (8,120 feet) and the less important Col de Fenêtre (8,856 feet) leading north to Martigny, on the Upper Rhone; and the

Little St. Bernard highroad to the Isère, together with the Col de la Seigne and Col du Bonhomme road, to the Val Montjoie and the valley of the Arve. Aosta has now a population of 8,000. It was an important place in the Roman period, as the existing antiquities testify. The location of Bellinzona, in northern Italy, makes it the centre of radiating lines of communication. It commands two railroad lines, one of which leads southeast to Milan, the other south to Genoa; and is the converging-point of four Alpine routes—the St. Gothard to Lake Lucerne, the Lukmanier Pass (6,290 feet) to Disentis, on the Upper Rhine, the Greina Pass (7,743 feet) to Ilanz just below, and the San Bernardino to the Hinter Rhine and Coire. Bellinzona has now a population of 2,500. In the Middle Ages it was strongly fortified by the Dukes of Milan, and was regarded as the key to the route between Lombardy and Germany. But one of the most remarkable situations of this kind is to be found in northeastern Afghanistan, at the southern foot of the Hindu-Kush. The village of Charikar, near the confluence of the Panjshir with the Ghorband, a northern tributary of the Kabul river, is the converging-point of eighteen passes over the Hindu-Kush, and probably occupies the old site of *Alexandria ad Caucasum.* Kokan, commanding the approach to the passes of the western Tian-Shan and the northern Pamir, is an important place in point of population, civilisation, and trade. Its bazaars are very active, and are the best-stocked in Russian Turkistan, with goods from Europe, Persia, and India.

Important points for towns are found also where transverse valleys intersect longitudinal valleys. Innsbruck is the capital of the Tyrol, because it controls the Brenner and also a western route up the valley of the Inn and across the Arlberg Pass (5,994 feet) to Lake Constance. Further south, Brixen lies at the junction of the Brenner and Pusterthal, which leads directly east to the valley of the Drave and the Danube. The importance of the Pusterthal and the Arlberg is evidenced by the fact that they are now traversed by railroads. The Furka Pass (8,150 feet), which connects the valleys of the Upper Rhone and the Upper Rhine very near where the central mass of the Alps is crossed by the St. Gothard road, lies too high for any town to develop here; but the streams which it connects present a long line of villages, representing a series of passes over the northern and southern ranges, just as do the villages of other longitudinal valleys of the Alps, like the Inn, the Adda, and the Mur. Where the Upper Rhone leaves its great longitudinal valley and bends at a right angle northward to Lake

Geneva, we have the town of Martigny (Roman Octodurus, 1,558 feet elevation), which commands, besides the routes up and down the Rhone valley, a number of passes south over the Pennine Alps to Italy, and over the western range to Savoy. The location of Martigny is duplicated in that of Coire (Curia), at the elbow of the Upper Rhine, with its connection by river north to Lake Constance, south by five passes (Julier, Septimer, Splügen, San Bernardino, and Lukmanier) to Italy, and southeast by the Albula and Flüela passes to the Engadine. Though situated at an altitude of 1,936 feet, Coire has a population of about 9,000. All such towns are distinctly mountain settlements; they are centres of mountain life, and their importance is due to the routes of highland travel they control.

(*To be continued.*)

MAP NOTICES

BY

HENRY GANNETT.

During the past six months the U. S. Geological Survey has issued thirty-five new sheets, scattered over the country, and illustrating widely differing topographic forms and degrees of culture.

In Maine are two sheets, Orland and Bucksport, both in the southeastern part of the State. They are upon a scale of 1:62,500, with a contour interval of 20 feet, and represent a diversified country, covered with rounded, irregular hills, with scattered lakes.

In New York are three sheets—Dryden and Watkins Glen, situated upon either side of the Ithaca sheet, and Macedon, situated upon the shores of Lake Ontario. These are upon the same scale and have the same contour interval as the other sheets of the State, viz: 1:62,500, and 20 feet. The Watkins Glen sheet is interesting in the fact that it represents the southern part of Seneca Lake, showing it to have the form of a glacial gorge, with straight parallel walls rising steeply from the water to an altitude of 300 to 400 feet above it. A level valley, with a horizontal bottom, extends three miles, with an almost imperceptible rise from the head of the lake southward. Streams flowing into the lake have as yet, in most cases, cut but very slightly into its walls; but Watkins Glen is a water-worn gorge, cut sharply to a depth of between 300 and 400 feet.

The results of the co-operation between the State of Pennsylvania and the United States Geological Survey are illustrated in the form of five sheets, all toward the western part of the State. These are upon a scale of 1:62,500, with a contour interval of 20 feet. Girard lies in the northwestern part of the State, bordering upon Ohio and Lake Erie. Gaines and Elkland are in the northern part of the State, including portions of Potter and Tioga counties. They are excellent examples of the dissected Allegheny plateau. Masontown and Uniontown lie in the southwestern part of the State, and include portions of Fayette and Greene counties. They also represent portions of this plateau, but not as characteristic

samples of it. They include much of the Connellsville coke region.

The Rancocas sheet, of New Jersey, upon a scale of 1:125,000, with a contour interval of 10 feet, is a reduction of four sheets of the original map, and represents a part of the level Atlantic plain in the eastern middle portion of the State.

The Oakland sheet, comprised mainly in Maryland, is upon a scale of 1:62,500, with a contour interval of 20 feet, and represents a portion of the Allegheny plateau in the western part of that State.

Co-operation with the State of Ohio has resulted in producing four sheets, all on a scale of 1:62,500, with a contour interval of 20 feet. Two of these, East and West Columbus, represent the capital of the State, with the surrounding country, a region almost without relief, and traversed by well-graded streams. In the northern part of the State we have the Toledo and Maumee Bay sheets, adjoining each other, representing a region almost as level as it is possible to imagine, rising gradually to the south and west from Lake Erie.

In Indiana is one sheet, Toleston, situated southeast of Chicago, on the shores of Lake Michigan.

The St. Croix-Dalles sheet, in Wisconsin and Minnesota, on a scale of 1:62,500, with a contour interval of 20 feet, represents a region covered with glacial drift, forming irregular hills, and dotted with numerous lakes and ponds.

In North Dakota is one sheet, Pingree, upon a scale of 1:125,000, with a contour interval of 20 feet. The region represented is nearly at the source of James River, or Dakota River (as it should be by United States statute), a country of slight relief, covered with glacial debris, and with many depressed areas, a region in which the drainage system is still infantile.

In South Dakota are two sheets—one Canton, in the southeastern part of the State, representing a recently glaciated country, level, with few streams, and those of slight grade; the other sheet is the result of a re-survey about the city of Deadwood. It is on a scale of 1:125,000, with a contour interval of 100 feet, and lies in the northeastern part of the Black Hills.

In Nebraska are two sheets, Ogalalla and Paxton, adjoining each other. They are upon a scale of 1:125,000, with a contour interval of 20 feet, and represent the valleys of the North and South Platte Rivers. The former is a large stream, carrying at all times of the year a considerable volume of water; the latter is,

during most of the year, little more than a bed of sand. The narrow strip of country separating the two rivers shows a curious northwest and southeast trend, which is especially marked upon the Ogalalla sheet. North of the North Platte the country is extremely sandy, all the relief being produced by sand-hills.

In Arkansas is one sheet, Fayetteville, situated in the northwestern part of the State. It is on a scale of 1:125,000, with a contour interval of 50 feet, and shows a low plateau highly dissected.

In Indian Territory are six sheets, all upon a scale of 1:125,000, with a contour interval of 50 feet. Four of them—Canadian, Okmulgee, Wewoka and Vinita—lie in the northern half of the Territory, and show a country of little relief, and that little presenting no decided characteristics. The other two, Sallisaw and Winding Stair, are in the eastern part of the Territory. Arkansas River traverses the former a little north of its middle, while the southern half of that sheet and all of the Winding Stair represent the characteristic crooked ridges of the Ozark Mountains, alternating with broad valleys, and cut by frequent water-gaps.

In Texas is one sheet, Flatonia, upon a scale of 1:125,000, with a contour interval of 25 feet. This is situated in the southern part of the State, and represents a country of little relief, and almost without flowing water, with the exception of Colorado River, which crosses its northeast corner.

In Wyoming are two sheets, both in the Bighorn Mountains. They bear the names Bald Mountain and Cloud Peak, and are on a scale of 1:125,000, with a contour interval of 100 feet. The former shows the western rim-rock of the Bighorn plateau, and in the northeast a bit of the eastern rim-rock, thus showing a broad section across the plateau. These rim-rocks, which are composed of stratified beds tilted up against the mountains, still have nearly as great an elevation as the summit of the plateau, erosion having as yet made but little progress in degrading them. In many cases the lower rocks composing the rim-rock lie in place across, or nearly across, the plateau. Thus, beds of Cambrian strata still cover great areas of the summit of the plateau, while in other places erosion has exposed the granites. A partial section of the range or plateau is shown in the Cloud Peak sheet. Here the western rim-rock crosses the western part of the sheet, but the eastern rim-rock is beyond its limits. A little east of the middle of the sheet rises out of the plateau a high mountain range, reaching in Cloud Peak, the highest summit, an altitude of 13,165 feet. This range is of granitic rocks, and has been extensively glaciated; indeed, four

small glaciers still exist in the immediate neighborhood of Cloud Peak, while everywhere are cirques, glacial gorges, lakes and hanging valleys.

In California are two sheets. Tujunga, upon a scale of 1:62,500, with a contour interval of 50 feet, lies immediately north of Pasadena, and includes part of the northern side of the San Gabriel Range, an extremely rugged granite mass, with a maximum altitude within this area of about 7,000 feet. The other, known as Elsinore, is on a scale of 1:125,000, with a contour interval of 100 feet. It lies south of San Bernardino, and includes the city of Riverside in its northwest corner. It represents a valley region, interspersed with bare or chaparral-covered hills of no great altitude.

The Department of the Interior of Canada has recently issued a map of the Dominion, upon a scale of 100 miles to 1 inch, showing drainage, boundaries, and other cultural features consistent with the scale. It is a convenient map for general reference, being, presumably, brought well up to date. The interesting feature of the map to people of this country is the position given to the Alaskan boundary from Mount Saint Elias southeastward. It is represented as including Revillagigedo Island and all the country to the eastward in Canada; hence the line closely borders the coast, cutting off the fiords, and, in defiance of the *modus vivendi*, crosses Lynn Canal and Glacier Bay midway of their length, follows apparently the crest of the Fairweather Range, and crosses Yakutat Bay below the bend.

Atlas of the Philippine Islands. Published by the U. S. Coast and Geodetic Survey, as "Special Publication No. 3."—The maps of this atlas were prepared from surveys by Spaniards and Filipinos, under the direction of P. José Algué, Director of the Observatory of Manila, and presumably they embody the fullest information obtainable at the present time concerning this group of islands. The atlas contains, besides a general map of the Pacific, general maps of the islands, showing their provinces, the distribution of peoples, the distribution of volcanic phenomena, together with depths of the neighboring seas, the distribution of meteorological and seismical observatories, and the distribution of earthquakes. These general maps are followed by 24 maps, showing the islands in some detail. Upon them the provinces, or departments, are represented in different colors, the drainage and the sea in a blue tint, and the relief by crayon shadings. Among these

maps are scattered detailed sketches of harbors, volcanoes, and other features of special interest upon still larger scales.

This atlas furnishes, in convenient form for reference, probably the best maps of the islands to be obtained.

The maps are lithographed by Hoen & Co., of Baltimore, and are an excellent specimen of that firm's work.

The atlas is preceded by a geographic description and a dictionary of names. This latter has been provisionally adopted by the U. S. Board on Geographic Names, and its publication will go far toward unifying spelling and usage.

NOTES ON GEOGRAPHICAL EDUCATION.

BY

RICHARD E. DODGE.

THE STATISTICAL AND THE GEOGRAPHICAL POINTS OF VIEW IN ECONOMIC GEOGRAPHY.—PROFESSOR JEAN BRUNHES*, OF THE UNIVERSITY OF FREIBURG (SWITZERLAND), has recently printed a very excellent paper on the point of view that ought to obtain in the study of economic geography, if the work is to be really geographical.

The paper opens with a consideration of how a teacher may present economic geography merely from the statistical side without attempting to show any of the geographical principles that have helped in bringing about the geographical conditions. On the other hand, the author pleads that in all work, no matter how elementary, a certain amount of statistics, expressed in round numbers, be included. He then goes on to explain how statistics should be used in the form of averages representing the geographical conditions of a country in reference to rainfall, population, products, etc., and emphasizes the fact that a true average is not found by averaging extremes. For instance, one cannot estimate accurately the productiveness of a country from a statement of the annual rainfall in gross amount. The geographer needs to know more than this; he needs to know the average per month, so as to know whether the rainfall is sufficiently well distributed during the growing season. Several other pertinent illustrations are worked out in a similar way.

Emphasizing the value of making generalizations rather than learning scattered facts, the author urges strongly that not only the principle, but the process of getting the principle, is important, because the statistics are destined to be out of date before the pupil has reached man's estate.

In the latter part of the paper the writer outlines the field of physical geography, of political geography, and economic geography. He shows how physical geography should be organized from

* Jean Brunhes, Différences psychologiques et pédagogiques entre la conception statistique et la conception géographique de la géographie economique. *Études Géographiques*, 1, 4, Institut Géographique de l'Université de Fribourg (Suisse), 1900.

the causal standpoint, and how political geography should not be considered as determined, but rather influenced, by the physical condition of a region. Taking the distribution and production of cotton as an illustration, the author analyzes the facts in great detail, and shows how the knowledge of the present economic conditions of cotton demands a knowledge of the physical and political geography of the cotton-growing areas. In conclusion, Professor Brunhes urges the method of research—the scientific method in all economic work in geography in all stages of the study.

This paper is a very suggestive and well-ordered contribution to a subject that seriously lacks organization at the present time. Commercial and economical geography are in the air, and the attempts at organization are many, but thus far nothing permanent and usable has been perfected, at least for secondary and commercial schools. The article in question should be read by all students of the subject, for it is valuable, not only in itself, but also for the many excellent references it contains.

THE SCHOOL OF GEOGRAPHY AT THE UNIVERSITY OF OXFORD.—The *Geographical Journal* and the *Scottish Geographical Magazine* for March both present interesting and instructive accounts of the School of Geography at Oxford University during 1900. The attendance during the year has been very promising, though there is much left to be perfected before the school work may be wholly satisfactory. The attendance varied from 100 in the Michaelmas term to 16 in the Easter term, including many women. By far the larger number attended the lectures only, and particularly the lectures devoted to historical geography, and took none of the laboratory work. Indeed, the numbers attending the laboratory instructions were 6, 4 and 5 in the three terms. Such a division of interest shows strikingly the point of view in reference to geography held largely in Great Britain, and the contrast with the University geography work in the United States.

The courses of lectures given, furthermore, are not as continuous or as intensified as are University courses in geography in this country, as is shown by the number of lectures devoted to the several subjects treated. We find the shortest series a group of five lectures, given to the Natural Divisions of the Old World, and the longest one of sixteen lectures on the Atmospheric Circulation and the Historical Geography of Greece and the Greek World. Six series were given in the field of physical geography and six more in historical geography. In the latter, besides the course noted above,

are the following: The Development of Geographical Ideas (7 lectures); The Historical Geography of the British Isles (7 lectures); that of the Romance and Teutonic Countries of Continental Europe (14 lectures); that of North America, Australia, and the Cape (14 lectures); The Geographical Development of the Roman Empire (8 lectures). The laboratory and field exercises were devoted to cartography, field surveying, the study of maps, terrestrial magnetism, etc.

About $1,100 have been spent on equipment, and the school has, fortunately, received many valuable donations in the way of publications and maps. The scholarship of £60 was awarded in October to Rev. E. C. Spicer, of New College. The scholar must study a year in the school, with a view of obtaining the diploma, the scope of the examination for which was outlined in this BULLETIN for October, 1900, p. 352.

OUTLINES FOR LOCAL FIELD EXCURSIONS IN GEOGRAPHY.—Those teachers in secondary schools who desire to conduct field excursions in geography are frequently handicapped by their lack of acquaintance with the possibilities of the local field, and are in need of outlines that will suggest not only localities that may be used for the illustration of certain phenomena, but the means of getting to the localities and the practical difficulties that may be favorable or unfavorable to the conduct of excursions. At the last annual meeting of the New York State Science Teachers Association Professor W. M. Davis, of Harvard, urged strongly the preparation of such outlines for various centres.

Good illustrations of the possibilities along these lines are presented in two small circulars that have recently appeared outlining helpful field trips that may be undertaken about Brockton and Springfield, Massachusetts.*

The first of these pamphlets opens with a brief consideration of the geography and geology of Brockton, with references to the literature of the area. Following these are listed twenty-eight different localities, with brief statements of the principal objects to be seen there. Each locality is then considered in detail, with pertinent and suggestive questions that not only bring out the

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* The Fields of Brockton: Notes for Field Study in Geography and Geology, by Mark S. W. Jefferson, Brockton Public Schools.

An Outline of Eight Excursions for the Study of the Physical Geography and Geology of Springfield and Vicinity, by William Orr. Published for the Springfield Geological Club by the City Library Association, 1901.

problem of the areas, but also suggest the method of field work to be followed. Several sketch maps are included, and the pamphlet closes with an index showing at which localities various topics may best be illustrated.

The pamphlet by Mr. Orr opens with an outline of important features of the vicinity of Springfield, considered under the following heads: The Upland Area of Crystalline Rocks; The Broad Valley Floor of Sandstone; The Trap Rock Area; The Glacial Deposits; The Epoch of the Glacial Lakes; The Terrace Formation. References are given to the available literature.

Following this introduction are the outlines of eight field excursions, in each of which directions are given for reaching the area, and a good account of the principal points to be seen is included. Certain of the localities are illustrated by good half-tones, and the pamphlet as a whole is very attractive in its appearance.

Such outlines as these are in the right direction, and should be very valuable in giving an impulse to field excursions in the localities concerned, and certainly stand as excellent guides in a much-neglected field.

GEOGRAPHY IN THE ELEMENTARY SCHOOLS.—The United States Commissioner of Education, W. T. Harris, has recently published a short but very suggestive paper entitled *Geography in the Elementary Schools.* This article has been widely printed in the educational papers, and should be generally read and assimilated by the elementary school teachers. The paper is a plea for a place for a well-ordered geography in the school curricula, and is an argument against the validity of the severe criticism of some students of educational problems, that geography is a chaos and not a composite, and hence, perhaps more harmful than helpful to children.

Commissioner Harris believes that geography, when well taught, is more capable than any other branch of arousing in a child a thirst for knowledge, of giving a many-sided interest, and of giving him the general habit of looking upon one fact as an explanation of another.

The further claim is that geography, when well taught, is a corrective of superstition, as it substitutes for imagination insight into causal relations and for fancy, thought.

In answer to the criticism that geography is too composite, the author emphasizes the fact that the child's experience is composite, and that hence no subject that was not composite could make the best use of the child's experience and lead him to order his know-

ledge—in other words, could give him the beginnings of the scientific method. He further urges that geography is the one subject that unites the child to his environment, and hence, that geography in schools should not deal with the mere physical features, or, on the other hand, with the distinctly human side, since

> Geography unites the study of the natural elements—land and water, climate and productions—with the study of man's present conquest and use of the same.

And, again, that geography is no more a composite than is any other subject; that in all education the pupil begins with the composite and goes toward the simple by analysis.

The points that Commissioner Harris makes in reference to geography teaching are just those long advocated by leading experts in the field. Coming as they do, however, from one who has the universal esteem and honor of the teachers of the country, they ought to be of material assistance in promoting good geography work in elementary schools.

THE ORGANIZATION OF GEOGRAPHY.—Professor Charles R. Dryer, of the State Normal University, Terre Haute, Indiana, presents in the January number of the *Educational Review* an article entitled *The Organization of Geography*, the first part of which is a scholarly and helpful presentation of most modern and accepted points of view in reference to the scope of geography. Opening with a brief account of the development of geography and the work of Humboldt, Ritter, and Peschel, the author passes on to a consideration of the field of geography, which is generally recognized as including the following topics:

(1) The earth as a planet: its form, dimensions, motions, and relations to the sun. This is the astronomical phase of the subject, and its method is mathematical.

(2) The land: its outline and relief, the origin and development of its surface forms, and the materials and structure of the earth crust so far as necessary for the explanation of surface forms. This is the geological phase of the subject, and has recently developed into large proportions, forming the new science of geomorphology.

(3) The sea: its form, floor, volume, and contents, and the properties and movements of sea-water.

(4) The atmosphere: its properties, conditions, and activities, and their results as manifested in climate. It is in this department that geography is most dependent upon physics.

(5) Plants and animals: their distribution as dependent upon environment. This is the biological phase of geography.

(6) Man: the distribution and movements of population; human conditions, industries and occupations as determined by land and water, relief and climate, natural resources, and economic products. This forms the physical basis of history, sociology, and economics.

Taking up the element of distribution as being the keynote of geography in a broad sense, the author quotes the accepted definition of geography, as used in Europe, and shows that distribution is considered as important in all branches of geography, though somewhat in abeyance in the discussion of land forms.* Though geography must take into account the causal relations in the distribution of many different factors, it is not yet clear to all, as the author shows, which one should be used as the basis for the organization of the subject. In America the Ritterian idea of the earth as the home of man still holds to a certain extent, though, as Dr. Dryer says:

> "The scientific geographers of to-day no longer attempt to discover how the earth has been fitted for the home of man, but, first, how all the elements and forces of nature combine and interact to produce the present conditions of relief, climate, and life; second, how man has gradually, and still imperfectly, become adapted to these various conditions.

The scientific organization of the subject in the school field is yet far in the future, though great advances have been made in the last ten years, especially through the work of the well-known texts of Frye, Redway and Hinman, and Tarr and McMurry.

Though it is universally recognized that both the human and the physical elements are essential in school work in geography, the efforts that Dr. Dryer outlines are but a beginning along rational lines. There are so many elements involved, varying from the conservatism of parents and school boards to the over-ambitious and somewhat premature attempts of geographers to bring about the millennium, that the problem is still one of the greatest in the school field. With, however, the generally accepted opinion as to the scope and method of geography there should be no retrogression. Advance by the specialists at just the rate to encourage and spur on the teachers will bring about an organization of geography in the next decade perhaps greater and probably more permanent than some of the attempts of the last decade. Here is the problem to which teachers, geographers, and book publishers should devote their best united attention.

School Courses of Study in Geography.—Two very successful courses of study in geography have recently appeared and deserve-

* See also *Editorial* in *Journal of School Geography*, February, 1901, pp. 63–64.

attention as showing the current point of view in geography work in different parts of the country. The first is the course planned for the City and County of San Francisco,* and the second is the course in operation in the Horace Mann Schools of Teachers College, Columbia University, New York City.† These two courses have many things in common, and yet show many differences, not merely in details, but in the point of view recognized by the authors as pertinent to school work.

In each case the movement is from the home outward to the larger features of the world, though the method followed and the time of treating such topics as a special study of the United States are different. The second course differs from the first, inasmuch as the essential features of physical geography are introduced gradually and so applied that there is no call for a special course in physical geography in the elementary schools.

The San Francisco course contains many helpful suggestions to teachers as to the best ways to enliven their work with topics of interest from the daily news, etc., and includes a brief series of references to the better books.

The Horace Mann School Course is much more detailed in presenting the essential facts of each year, and contains a certain amount of discussion of the reasons for the order as presented, and includes a carefully selected series of references for teachers and pupils. This course also presents a detailed outline for a High School course in physical geography, intended to cover the ground required for candidates for the entrance examination in physiography at Columbia University.

The first course is planned for the public schools, with varied conditions of work, and the second for a large private school, where the conditions are particularly favorable. Each course is deliberately and carefully planned to secure the best amid the conditions at hand, and ought to be of help to progressive teachers generally.

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*Courses of Study for the Public Schools of the City and County of San Francisco, Cal., 1901, pp. 106–142. The Murdock Press, San Francisco.

†Geography in the Horace Mann Schools. Teachers College Record, Volume II, No. 2, March, 1901, pp. 63–164.

NOTES ON CLIMATOLOGY.

BY

ROBERT DE C. WARD.

THE DEPOPULATION OF KANSAS, NEBRASKA, AND COLORADO.—One of the most pathetic incidents in the history of the settlement of our country west of the Mississippi River was that connected with the sudden increase in the population of portions of that region about fifteen years ago, and the suffering and impoverishment which the new settlers had to face in the succeeding years. During the period from 1886 to 1889 there was a sudden "boom" in western Kansas and Nebraska and eastern Colorado, resulting from a large increase in land values which followed a succession of unusually rainy seasons. There was a very rapid gain of population, stimulated somewhat—how far it is impossible to determine with accuracy—by dishonest representations of the climatic conditions made by unscrupulous land-dealers. The increase in population in Kansas has recently been considered by Gannett (see this BULLETIN, No. 5, 1900), who has shown that in 1885, at the beginning of the "boom," Kansas had a population of 1,268,530, while in 1888, near the crest of the "boom," the population numbered 1,518,553. A number of dry seasons followed, and the new settlers were literally starved out. In the midst of much suffering, the country was quickly depopulated again. In 1890, the population of Kansas had been reduced to 1,427,096; and in 1895 it was only 1,333,734. The State thus gained nearly 250,000 inhabitants in three years, and later lost nearly 200,000. Similar conditions obtained in the two Dakotas. This exodus of most of the new "boom" settlers naturally resulted in the abandonment of villages and farm-houses everywhere over this district, and one of the most pathetic sights which the traveller may look upon to-day, in his journey across the region from the 100th meridian to the foot-hills of the Rocky Mountains, is the abandoned and ruined house, or farm, or stable, built in the days of the "boom," when prospects were of the brightest, and left when the family was forced to go because the deficiency of rainfall made it no longer possible to live there. A graphic description of the present aspect of the "boom" country is given by J. E. Payne in BULLETIN 59, December, 1900, of the Agricultural Experiment Station of the Agricultural College

of Colorado, under the title *Field Notes from Trips in Eastern Colorado.* Of many of the towns which sprang up like mushrooms, and aspired to become large cities, railroad centres, or county seats, there are to-day left only a few cellars and two or three scattering houses. On the site of Arickaree City one store building now stands, and is the home of four persons, while the Arickaree post-office is on a ranch eight miles away. In the neighborhood of Lindon nearly all the land for miles around was once taken up, while to-day one may drive for ten or twenty miles without seeing a house:

"The site of old Lindon is now marked by a few heaps of earth and a few holes in the ground. . . . At Harrisburg, one family still lives. Thurman, also called Stone City, once had two banks, and two railroads were surveyed through it during 'boom' times. Now one family lives in Thurman. But a colony of hardy Mennonite farmers still holds claims near enough together to make lanes necessary. Two lanes cross at Thurman post-office."

The farmers who are now living in the region have come to see that there is not enough rainfall for successful agriculture. They have turned their attention chiefly to stock-raising, but usually also raise some grain, and always manage to produce enough rough forage for their cattle. Thus, after the "boom" and the futile attempt to turn the debatable ground west of the 100th meridian into a farming country, the possibilities of the region, under the control of climate, have come to be clearly recognized. The future will see no more of those pathetic struggles on the part of man to claim solely for agriculture a region which the climatic control has decreed shall be chiefly a grazing country.

THE DISTRIBUTION OF RAINFALL OVER THE LAND.—In 1882, Loomis published the first good map of the mean annual rainfall of the world. This appeared in the *American Journal of Science*, Third Series, Vol. XXIII, Jan., 1882, under the title *Contributions to Meteorology*, *Sixteenth Paper*. In January, 1883 (*Amer. Journ. Sci.*, 3d Series, Vol. XXV), a second edition of the same map appeared, as the eighteenth paper of the *Contributions to Meteorology*. Loomis's map was used by Hann in his *Atlas der Meteorologie* (Berghaus' Physikalischer Atlas. Abtheilung III. Gotha, 1887), and a revised form of it was published by Buchan in the *Scottish Geographical Magazine* for 1887. In 1889, Loomis himself published a revised form of his original map in Chapter III of the revised edition of the *Contributions to Meteorology*. In 1898, Supan brought out a new map of mean annual rainfall, and four charts showing the rainfall of the four seasons (*Die Verteilung der Niederschläge auf der*

festen Erdoberfläche; Petermanns Mitteilungen, Ergänzungsheft No. 124. Gotha, 1898), and Dr. A. J. Herbertson also published a new map of mean annual rainfall. The latter is reproduced in Bartholomew's *Atlas of Meteorology* (1899).

The most complete of all publications on rainfall, as well as the latest, is the recent one by Dr. Herbertson, of the School of Geography at Oxford University, entitled *The Distribution of Rainfall over the Land* (Roy. Geogr. Soc., London, 1901. Pp. 70. Maps 13. Pl. I). Dr. Herbertson has for the first time drawn *monthly* rainfall maps for the world. In doing this he has gone ahead of all previous students of the subject, and has made one of the most important contributions to meteorology of recent years. These monthly rainfall maps were reproduced, on a small scale, in the *Atlas of Meteorology* (1899), but are far more useful on the large scale of the present publication. Dr. Herbertson rightly points out that seasonal rainfall maps are unsatisfactory, for the value of the seasons as a basis for constructing maps of this sort differs greatly in different countries, and three months are often too long a period to illustrate the seasonal peculiarities of rainfall.

The maps contained in *The Distribution of Rainfall over the Land* show the lines of equal rainfall for 25, 50, 100, 200, 300 and 400 mm. The differences in the lengths of the months are allowed for, the actual values used for the isohyetal lines being the nominal values multiplied by the number of days in the month, and divided by one-twelfth of the number of days in the year. Thus, the lines on the February map marked 100 mm. really represent an actual rainfall in February of 92 mm. Every isohyetal line has, therefore, two meanings. The value given on the map is that for the month reduced to one-twelfth of a year. The same line represents an actual rainfall during that month somewhat less or more than its nominal value, according to the length of the month. The maps are colored in seven different shades or colors. There are five shades of the conventional "rainfall" blue, one of a lightish pink, and one of a light brown. There is a separate discussion of the distinctive features and peculiarities of the rainfall of each month, the earth's surface being divided, for the purpose of systematic description, into three regions, viz: the sub-equatorial baric trough or depression; the constant or steady or trade-wind system of winds, and the north and south temperate storm-wind systems.

Dr. Herberton's valuable series of charts, and his brief but pointed discussions of them, make a much more detailed study of the world's rainfall possible now than ever before. This monograph is assured a hearty welcome and effective use. The bibliography

at the end of the report, of general works and publications on special areas, adds materially to the value of the paper.

The Climate of the Argentine Republic.—Of the South American republics, Argentina is far and away the foremost in point of view of organized meteorological work. The Argentine meteorological service was inaugurated by the late Dr. B. A. Gould, and has, under the present able directorship of Mr. Walter G. Davis, attained a high rank among the weather services of the world. Volume after volume of meteorological tables and discussions have been sent out from the Meteorological Office at Córdoba. As the number of stations has been increased year by year, and more and more data have been collected from the sparsely settled portions of the country, the material has rapidly been accumulating for a complete climatologic study of Argentina. Such a study—an admirable one in every way—has recently been published as a part of the second census of the Argentine Republic (Buenos Aires, 1898. Tomo I. Cuarta Parte. *El Clima de la República Argentina, por Gualterio G. Davis*, pp. 259–381). Unfortunately, this report is, for all practical purposes, buried. No reprints of it have been struck off, and it is still unknown to meteorologists at large. Mr. Davis has, in his monograph (which is one of the most important climatologic publications issued in recent years), given an excellent presentation of the chief climatic features of Argentina. The country itself, because of its great north and south extent, is an extremely interesting one, including, as it does, a great variety of climates between its northern boundary, beyond the Tropic of Capricorn, to its southern extremity, at latitude 55° S. Great differences of temperature and precipitation naturally occur over this extended territory, and the products of the soil and occupations of the people vary with the varying climatic conditions. All the important elements of the climate are tabulated and discussed. A large number of graphic representations show the correlations between these various elements at some of the more important stations. Finally, a series of charts, based on the latest and most complete data available, shows the temperature, pressure and winds for the four seasons and for the year, and the mean annual rainfall. These charts show, for the first time, the distribution of these elements over this southern portion of South America, in detail, and on the basis of the reliable data collected by the Argentine Weather Service. A reprint of Mr. Davis's monograph in Spanish or, better still, in English would be a welcome addition to the meteorological libraries of the world.

ABSTRACT OF AN ADDRESS BY MR. E. WHYMPER.

"TWENTY THOUSAND FEET ABOVE THE SEA."

In the discourse which was delivered by Mr. Edward Whymper on November 13th, 1900, to the American Geographical Society, he pointed out that the initiation of mountain-climbing and mountain-travel in Europe was due to the young Genevese Professor of Philosophy, Horace Benedict de Saussure, who offered a considerable reward in 1760, and in later years, to any one who would discover a practicable way to the summit of the great Mont Blanc. The earliest attempts to ascend the mountain were made from the Valley of Chamonix; then others were made by way of the Val Montjoie, and ultimately the summit was gained from the original direction.

Mr. Whymper then proceeded to show the manner in which mountain-climbing is practised at the present time, and illustrated this part of his discourse with an extensive series of lantern-slides, showing mountaineers at work upon rock, snow and ice, climbing and cutting, ascending and descending, and crossing snow-bridged crevasses, etc., etc. He laid stress upon the value of rope to mountain-climbers (when it is properly used), and, while paying homage to the courage and enterprize of the early mountaineers, expressed the opinion that it was surprising they did not more often come to grief, through their complete ignorance of everything that might occur to them above the snow-line. He particularly insisted upon the importance of mountaineers acquiring a mastery of the art of balancing, and upon the necessity of their keeping upon their legs; and emphasized his remarks by referring to the catastrophe which occurred upon the first ascent of the Matterhorn through the inability of one of the party to maintain his balance. When he was in a position where a slip meant almost certain death, he lost his footing and his life, and caused the death of three of his comrades.

The lecturer then passed on to speak of the foundation of the Alpine Club (the parent of a number of similar institutions which have now been established throughout the world, embracing more than 100,000 members), and of the competition which was displayed by its associates, soon after its foundation, in scaling the then untrodden summits of the highest Alps. "By the year 1865

scarcely any of the principal peaks remained unascended." A superb series of views of the highest Alps was shown in illustration, and it was pointed out the rule is that all mountains have an accessible side, and one side which is apparently or obviously easier to ascend than all others. "In 1865, one mountain in the Alps—one of the greatest—remained unascended, which was an exception to this rule. The peerless and incomparable Matterhorn is a mountain which is almost *unique* in appearing nearly equally inaccessible upon *all* sides, no matter the direction from which it may be regarded;" and this was demonstrated by means of a magnificent set of lantern-slides, taken from nearly every point of the compass.

Mr. Whymper next gave a sketch of his (the first) ascent of this mountain, and said that the earliest efforts to scale it were made from the south-west, as that side, from being much broken up, appeared to offer some chance of success. It was not until after he had made nine different attempts to scale it from the south and south-west side he began to entertain the opinion that an easy and natural way to the top would be found over the northeastern face, although that was one of the sides which appeared to be hopelessly inaccessible; and he explained in the following passage why he was led to entertain this idea. "I had noticed," he said, "that the main mass of the mountain was composed of regularly stratified rocks, dipping to the south and west; and that, in consequence of this, on the south side, the exposed surfaces were frequently (or generally) slabs of rock sloping *downward* and *outwards*, with their fractured edges often actually overhanging. This caused much of the difficulty in climbing the southern side of the mountain. I inferred that, if the same structure extended right through the peak, the great north-eastern face, instead of being hopelessly inaccessible, would be quite the reverse—that, in fact, it would be a great natural staircase, with steps inclining *inwards;* and, if that was so, its smooth aspect would be of no importance, for the smallest steps, inclined in that fashion, afford good footing. *This deduction was the key to the ascent of the Matterhorn.*"

After giving an account of this ascent, the lecturer passed on to his two ascents of Chimborazo, in the Republic of Ecuador. Although Humboldt, Boussingault, and many others had endeavored to reach the summit of this great mountain, Mr. Whymper was the first to succeed in doing so, in 1880, and his ascents are the only ones which have been effected down to the present time. In making this expedition several objects were kept in view, and first amongst

them was the study of what is called "mountain sickness," a term which is employed indiscriminately for the various affections which occur to human beings at great altitudes. These effects differ in different individuals, though they are all primarily due, according to Mr. Whymper, to the diminution in atmospheric pressure which is experienced as one ascends. In the case of himself and of his party no unpleasant effects were experienced until the height of 16,660 feet above the sea had been reached; but at that altitude (and at the pressure of 16.500 inches) both he and the two mountaineers he had brought from Europe were rendered incapable (or, to use his own expression, were placed *hors de combat*) through their inability to imbibe a sufficiency of air. In course of time both he and his assistants accommodated themselves to the conditions: 1, By breathing deeper; 2, by more frequent respirations; and 3, by eating less; and after passing a month at great elevations they were so far righted that they were unable to trace any effect due to diminution in atmospheric pressure, except that they were weaker (which was attributed to their having eaten much less than the amounts which they habitually consumed at low levels), and that at elevations of 16,000 feet and upwards they were unable to sustain active exertion except by breathing through open mouths.

In conclusion, Mr. Whymper referred to his ascent of Cotopaxi, "the loftiest of all volcanoes that are in working order," and showed views of its summit, etc., etc. The ascent was effected from the west, and an encampment was made on that side, about 100 feet below the most elevated point of the crater, at a height of 19,500 feet above the sea. The stay there of 26 hours, to study the crater by night and other matters, is probably the greatest length of time that any human beings have ever remained at so considerable an elevation.

GEOGRAPHICAL RECORD.

NORTH AMERICA.

The Topographic Survey of New York State.—The United States Geological Survey has thus far published seventy-three of the atlas sheets, giving the results of the topographic survey of this State as far as it has progressed. The sheets cover nearly all of the eastern tier of counties, but only the Brooklyn sheet of Long Island is yet ready. The survey has also been extended east and west across the State, through the Mohawk valley and to Niagara Falls, with a break in Wayne and Cayuga counties. The Ithaca, Elmira, and Olean sheets are all that are yet issued for the south central and south western parts of the State. The sheets now ready cover a little more than a third of the total area.

The Board on Geographic Names.—All the decisions of this Board on questions of geographic nomenclature, from the time of its organization in 1890 to the present, are included in the second edition of its second Report, just published. Nine years have elapsed since the publication of the first Report. The decisions since that time have appeared irregularly in pamphlet form. It will be a convenience to many writers who desire to profit by the decisions of the Board to have so much of its work in a single volume. Congress authorized the printing of 19,000 copies of the two editions of this report, which will probably supply the demand. The Report makes note of the action of Congress in overruling the decision of the Board that the Spanish Puerto Rico was the preferable spelling of the name of the island we had acquired. The time-honored English spelling, Porto Rico, is now appearing in all Government publications.

Geological Survey of Cuba.—Dr. C. Willard Hayes and Messrs. T. W. Vaughan and A. C. Spencer, of the United States Geological Survey, have been detailed to make a study of the mineral resources of Cuba. Dr. Hayes and Mr. Vaughan have reached the island and begun work. The expense of this undertaking will be met by the Cuban government. A careful study of the mineral resources of Cuba will be of much economic value to the island.

SOUTH AMERICA.

The Tocantins and Araguaya Rivers to be Opened to Commerce.—*Le Mouvement Géographique* (1901, No. 11) says that a

Belgian company will undertake to make the large Tocantins and Araguaya rivers available for commerce. These large rivers flow northward from the uplands of the state of Goyaz, in inner Brazil, to the Atlantic. They have usually been classed in the Amazon basin, but in fact have an independent outlet to the sea through the estuary known as the Pará river. About 300 miles from the sea they unite, and just below their confluence rapids begin to interrupt navigation. This interruption continues for about 100 miles, between Praia de Rainha and Alcobaça, in which distance the united rivers drop about 700 feet. A Brazilian company received a concession twelve years ago to build a railroad around the rapids, but was unable to carry out its contract. A Belgian company has succeeded to the rights thus forfeited by the Brazilian concern. A committee sent from Belgium has reported that the estuary is navigable by large sea-going vessels from the ocean to Cameta, over 100 miles; that ordinary river vessels may ascend to Alcobaça, about 300 miles from the sea; that the railroad around the rapids, 100 miles in length, involves no special engineering difficulties, and that both rivers above the rapids may be navigated to Goyaz by river steamers after some improvements have been made, particularly in the Araguaya. The rivers flow through large tracts of forests, which alternate with still larger areas of pastoral lands. For hundreds of miles there are rubber resources which have scarcely yet been touched, because transportation has been difficult. Cattle are the chief animal resource. Large herds abound in Goyaz and along the Tocantins, where a steer is worth only $10, though the average price is $40 at Pará, where a hundred head of cattle are killed every day for the market. Engineers are about to leave Belgium to carry out surveys for the railroad, and another party, led by Mr. Leon Thierry, has sailed to make a study of the mineral wealth of the two valleys.

Diversifying Crops in British Guiana.—The British Colonial Reports for 1898–99 say that the inhabitants of British Guiana, who have been chiefly engaged in the cultivation of sugar-cane, are beginning to direct their attention to rice, tobacco and other crops which may successfully be produced on the alluvial lands between the coastal area and the sand-dunes of the interior. There is export demand for these other crops, and it is highly desirable that British Guiana should cease to confine her attention to sugar-cane, which has been a precarious dependence in recent years, owing to the competition of beet sugar.

EUROPE.

THE SALT LAKE AT LARNACA.—The *Geographical Journal* (Feb., 1891) says that Mr. C. V. Bellamy has recently made an investigation of the salt lake at Larnaca, in Cyprus, to ascertain, if possible, the origin of the salt. The lake is about a mile southwest of the town of Larnaca, in a hollow on the east side of a basin whose lowest part is ten feet below mean sea-level. In a paper read before the Geological Society, Mr. Bellamy said the barrier between this lake and the sea is mainly composed of shelly sand, overlying a bed of stiff calcareous clay associated with conglomerate. The land between the lake and the sea is too salt to be cultivated, but on the other sides the soil is of average fertility. The sea-water appears to percolate through the sand, and being kept near the surface by the clay beneath, slowly reaches the basin, where it is evaporated by the summer heat and deposits its salt. Artificial channels have been made to intercept the flood-water of the lake's tributaries and convey it to the sea, so that it may not dilute the lake brine. The salt harvest begins in August, at the height of the summer heat. One heavy shower at this time suffices to ruin the salt prospects for the year. The quality of the salt is of unusual excellence.

HYDRAULIC POWER IN THE FRENCH ALPS.—According to the *Annales de Géographie* (Jan., 1901), the utilization of the water-power of France's Alpine region has become a question of much interest. The coal crisis (which led to advanced prices for that fuel last year), the activity in metallurgic and other industries, and the inadequacy for her needs of the home supply of coal in France, are turning attention to schemes for utilizing the water resources of the Alps. This mountain region in France has an area about equal to that of the Alpine districts of Switzerland, Lombardy, and Piedmont together, but is much less densely populated, and this is one of the reasons why Switzerland and Italy have surpassed France in utilizing the power of mountain streams. There are now fifty-eight factories, with 250,000 horse-power, in the French Alps. It is estimated that the minimum power at low water among these mountains which may be made effective is 3,000,000 horse-power. A committee of engineers, under the auspices of the Minister of Public Works, is now studying the project of M. Souleyre, who proposes to transmit, electrically, water-power from the lower Rhone for industrial and agricultural purposes.

ASIA.

Surveys in the Philippines.—It has been announced earlier that the Coast and Geodetic Survey is about to carry out a survey of the numerous harbors among the islands and make soundings in the coast waters to facilitate navigation. The navigable rivers will also be charted. The *National Geographic Magazine* says that civil service examinations are to be held in Manila for the selection of fifteen Filipinos to take part in this work. Young men who are selected will probably be brought to the United States for preliminary training in the office of the Survey at Washington before being assigned to field service.

Nagasaki as a Free Port.—The Chamber of Commerce at Nagasaki desires to give that port, which is surpassed in volume of business only by Yokohama among the ports of Japan, greater importance in the forwarding business. To this end they have petitioned their Government to establish a free port at Nagasaki similar to the free ports of Germany. In other words, they desire that a portion of the water-front be set apart as a place where goods may be landed without paying duties. These goods destined for other countries will be sent to Nagasaki for trans-shipment, and deposited in the free port till placed on board the vessels that take them to their destination. Nagasaki desires in this way to become an entrepôt for Korea and north China, a business that is now almost monopolized by Shanghai.

AFRICA.

A Railroad in Dahomey.—*Le Mouvement Géographique* (1901, No. 13) says that the French Government has decided to build a railroad, about 400 miles in length, from the port of Kotonu, on the Gulf of Guinea, to the Niger river, just west of the boundary of Sokoto. The line will thus traverse Dahomey from south to north. A preliminary survey has been made of the route as far as Paraku, about 200 miles inland, and the work of constructing this part of the line has already begun at Kotonu. The region which this railroad will traverse has a comparatively dense population. It is expected that the road will have an important effect upon the development of the French Sudan and Sokoto. It will reach the Niger above the rapids at Busa, which impede navigation, and it is expected to place the interior of the French Sudan within twenty days of Bordeaux.

Petroleum in Algeria.—The Governor-General of Algeria reports that there are four zones containing petroleum, extending

from northwest to southeast, in Western Algeria. The most southern zone is about 125 miles long. The petroleum indications resemble those at Baku and in Galicia, and seem to warrant large expectations. In Constantine, also, petroleum-bearing areas have been found which seem to be the continuation of the Oran zones. Several companies have applied for concessions to develop these oil resources. (*Deutsche Rundschau für Geog. u. Stat.*, Jan., 1901.)

Caves in East Africa.—Mr. P. Chaudoir, in *Le Mouvement Géographique*, describes some interesting limestone caves within a couple of hours' walk from the coast town of Tanga, in East Africa. One of them has a large opening in the wall of a cliff. A short distance inside are chambers, rising to a height of 100 and 250 feet, beyond which is a vast room covering an area of 5,000 square yards. He met the same difficulty in exploring these caves that is usually encountered in caves of tropical countries. The roofs and walls of the passageways are covered with bats. Many of them are very large, and one of them, killed with a stick, measured four feet ten inches from tip to tip of the wings. The explorer says he believes these caves are equal in extent to some of the most famous caverns of France.

The Siwah Oasis.—Last fall the *Zeitschrift* of the Berlin Geographical Society published an account of Lieut. von Grüner's visit to Siwah, west of Cairo, formerly consecrated to Jupiter Ammon, where the renowned oracle was once consulted by Alexander the Great. The German traveller was well received; even the Sheikh al Habun, the representative of the Mahdi of the Senussi, invited him to dinner, and the explorer departed of his own volition after a stay of a fortnight. He was not permitted, however, to make surveys, and he failed in his attempt to secure squeezes of the hieroglyphics in the Temple of Jupiter Ammon, but brought home numerous photographs of an ancient temple in Aghermi, which he was the first to visit. He ascertained that the temperature of the famous Fountain of the Sun is uniformly 88° F. at all hours of the day and night.

Professor G. Steindorff, in a later visit to Siwah, was more successful. He has a paper on his journey and explorations in the *Zeitschrift* (Dec., 1900). His party started from Cairo on Nov. 30, 1899, in the direction of Wady Natron, where many convents of Macarius and other saints were visited. Thence the party marched west for nineteen days, when they reached the Siwah oasis. The

exploration of the ruins of numerous temples brought rich results, and in the cemeteries of Zetun and Abul Anwaf many glass mosaics were found. The party started to return on January 8. In the Bahrieh oasis, where they remained seven days, two Egyptian temples, dating from the sixth century B.C., were discovered; and near El-Kasr-Bauiti two tombs of princes of the fourteenth century B.C. were found.

THE UGANDA PROTECTORATE.—Sir Harry Johnston, special Commissioner of the Uganda Protectorate, has issued a report on that important part of British East Africa. His report is accompanied by maps showing the climatic and other influences that will affect the future of the country. He divides Uganda into zones of altitude, as, in his opinion, the healthfulness of each district is mainly determined by elevation above the sea. On one map he shows large areas that are over 5,000 feet above sea-level, and almost entirely free from malarial fever. He considers the districts as healthful for the white race as the best parts of North and South Africa. The country between 5,500 and 3,500 feet is only moderately healthful, and the regions under 3,500 feet are not adapted to become the home of white men. This is the case along the banks of the Nile, the coasts of Lake Albert, and, in a lesser degree, on the shores of Victoria Nyanza. A rainfall map shows that a wide region north, east, and west of Victoria Nyanza has from forty to sixty inches of rain a year. The rainfall decreases to the north and northeast, and is probably less than ten inches a year on the southern half of Lake Rudolf. The most densely-peopled areas are along the western and northern shores of Victoria Nyanza and around Mount Elgon, northeast of the lake, where the density is from 60 to 100 to the square mile. The Waganda and other representatives of the Bantu races of Africa in Uganda have made great progress through the efforts of missionaries, but the negro tribes of the upper Nile, on the contrary, give little encouragement to missionary effort. About two-thirds of the country is extremely fertile. The abundance of the banana, which is the mainstay of the natives, encourages idleness among them, because they can procure all the food they need without effort. Wheat, barley and oats thrive in the higher regions, and almost every other cereal in the lowlands. The swampy valleys are admirably suited for the cultivation of rice, and there is no reason why Uganda should not become one of the great coffee-growing countries.

NOTES ON COMMERCIAL GEOGRAPHY.

One of the leading French trade papers says that the consumption of raw silk in the United States has for three years exceeded that of France. The manufacturing development of this country, which has equalled that of France since 1897, now surpasses it. Consul Brunot has written to the State Department that leading silk men of Lyons and St. Etienne say the day is coming when American manufacturers will sell silk piece goods and ribbons in Paris and London. Our silk industry has reached a large development only within the past few years. The home silk mills now produce the larger part of the silks this country consumes. At present, however, the silk trade is laboring under the disadvantage of over-production.

A company, chartered under the laws of South Carolina, is planting tea on 6,000 acres of land, purchased near Charleston. Tea requires rich soil for the best results, and, as little of the land on the proposed tea farm is in the best condition, only a small acreage will be planted this year. All the land will be enriched, and next year 5,000 acres will be planted. It is known that the tea plant will thrive in several Southern States, but the business has never been placed on a paying basis. The result of the present experiment will be watched with interest.

Bulletin 58 of the Census Bureau, devoted to cotton-ginning, is the first report of its kind made by a United States Census. The report shows the important changes that have occurred in the areas of cotton production. The high price of cotton after the Civil War led to its cultivation to some extent in California, Illinois, Indiana, Nevada, Utah, and West Virginia. With the advent of low prices cotton culture gradually disappeared from those sections not peculiarly adapted for it. The loss in the States lying along the northern border of the cotton belt is, however, more than offset by the increased production in the territory west and south-west of the Mississippi river. This increase is practically confined to Texas, the Indian Territory, and Oklahoma. In 1899 Texas produced 28 per cent. of the entire cotton crop, heading the list of cotton-producing States. The territory west of the Mississippi in 1899 produced 45 per cent. of the whole crop.

A report on the manufacture of beet sugar just published by the Census Bureau says that the beet is now yielding more than a third of our domestic sugar product. Thirty-five factories have been

built since 1896, and the thirty-one factories now in operation include nine in Michigan, eight in California, and fourteen in other States and Territories from Washington in the north to Mexico in the south and New York in the east. Most of the factories are large, substantial buildings, designed with the view to accommodate so much machinery that their present output may at least be doubled in the future. In view of these facts the industry in this country is now regarded as a commercial success.

The *Financial Times* of London says that our calico is now competing successfully with English prints in the British market. Calicoes made in this country are selling in England, and are considered to be excellent goods of their kind. This is an innovation in our cotton trade. The sheetings, prints, and other cotton fabrics made in this country are for the most part classed among the coarser products. We have not attempted on a large scale to make fine cotton goods. There is little demand for them at home, and the cost of making and finishing them in our mills is much larger than in England on account of the skilled labor required, for which we pay higher wages than British operatives obtain. So it happens that the cottons we have made for home consumption or export have in the main been common cloths.

The German Antarctic Expedition, which will start for Kerguelen Island in a few months, will give special attention to the study of sea life and its economic aspects. None of the useful varities of fish is yet known to exist in Antarctic waters. The southern boundary of the fishing regions now lies along the sailing routes between Cape Town, St. Paul Island, Tasmania, New Zealand, and Magellan Strait. It is thought, however, that useful fish may exist in Antarctic waters, and the German expedition will investigate this possibility.

The Royal Mail Steamship Company has contracted to place in each of its steamers plying between Europe and the Rio de La Plata a chilling apparatus, with a capacity of 1,500 beef carcasses. Three thousand carcasses will be shipped to Southampton each month by a single Montevideo company. The average voyage from the La Plata requires about 22 days. Other meat companies are making similar arrangements, and, according to Consul Swalm of Montevideo, the Rio da La Plata countries will in the future be a stronger competitor with the United States in the English and other European markets.

POLAR REGIONS.

The Baldwin-Ziegler Expedition.—It is announced that this expedition to the North Pole will start in June or July.

There will be two ships—the *America* (a steam-whaler, built two years ago) and the *Fridtjof*.

The *America* has three masts, and is barkentine-rigged. Her engines have been placed aft, so that the vessel will be able to climb the ice and tread it down. Her bows are iron-sheathed, well fitting her for cleaving her way through ice. Her screw is in a lifting well. The *Fridtjof* will accompany the *America* as a provision and equipment ship. She will accommodate a party of scientists and sportsmen, and will leave Tromsö, Norway, on June 25, to return on September 1. She is fitted up with laboratories, cabin accommodations, dark rooms, etc.

Arrangements have been made for sledges and for the dogs. The headquarters will be in Franz Josef Land, and the route followed will be substantially the one taken by the Duke of the Abruzzi. Mr. Baldwin expects to be gone for a year, and his party will live in this manner:

> There will be no sleeping out of doors. Plenty of tents will be taken, some of canvas, others of raw silk. Then there will be warm meals, as frequently as possible. Oil will be used as fuel. For warmth we shall have to depend on our clothes by day and sleeping-bags by night. The food for forward work will be condensed, but for life at headquarters and on ship I believe in ordinary food. No spirituous liquors will be allowed in forward work.

Capt. J. E. Bernier addressed the Canadian House of Commons on the 18th of March on the subject of his expedition to the North Pole by way of Bering Strait. He estimates that his expedition will cost about $130,000, including fair compensation, not only for the crew of his ship, but also for the members of his scientific staff. The vessel he is to build will be of 300 tons burden and modelled after the *Fram*, but with improvements suggested by Nansen's experience.

Lord Minto, the Governor-General, has become the patron of the enterprise, and it is hoped that the Dominion Parliament will give financial help. A subscription list has received numerous signatures.

The arrangements for the British Antarctic Expedition are completed.

The *Discovery*, which has been built like a whaler, with greatly-increased strength to withstand the ice, was launched on the 21st

of March at Dundee. Her equipment and stores will be taken on board in London.

The ship is 171 feet in length, with 34½ feet beam, and 1,500 tons displacement.

The expedition will leave London in July or August for Melbourne, under the command of Lieut. R. F. Scott, R.N.

The ship built for the German Antarctic Expedition was launched at Kiel on the 1st of April. It has been named the *Gauss*, in honour of the great mathematician.

A LITTLE-KNOWN COLONY.

BY

W. L. AVERY.

Fifty years ago the names of British Honduras and Belize were as frequently uttered in the Senate of the United States as those of Nicaragua and Costa Rica are now, for in the discussion of the Clayton-Bulwer Treaty the question of the rights and status of the tiny Government had to be defined and settled. Great Britain and the United States had agreed not to "assume or exercise any dominion over . . . . any part of Central America," but their understanding was that the engagements of the convention did not apply to Her Majesty's settlement at Honduras. The name Central America was applied collectively to the several Republics there organized, and the little colony was allowed to pursue its quiet way, forgotten by the greater part of the world.

The early history of the country is the legend of the buccaneers, and to one of the most celebrated or notorious, a Scotchman of the name of Wallace, the capital owes its name. The Spanish pronunciation *Vallis* was easily corrupted to Ballis, and this again to Balize or Belize. The attempt to trace the derivation to the French *balise*, a beacon, or rather a buoy, cannot well be sustained, for there is no record of any beacon—and, in fact, that is exactly what a buccaneer would *not* erect, his chief aim being to secure a hidden refuge when pursued by the Coast-guard. The designation of British Honduras was not assumed until the appointment of a Lieut.-Governor in 1862, and it is regretted by the native races even now that the name Balize was ever changed, the colony being now frequently confounded with the Republic of Honduras. The first record of any British inhabitants in this or any part of Central America dates back to 1638, when a vessel was wrecked on the coast, and the nucleus of the settlement was formed; and in 1671 the Governor of Jamaica reports an increase of customs and commerce with Belize "more than any of His Majesty's colonies."

The industry of these early pioneers was directed to the same channels that engage the labor of their descendants—the cutting and exporting of logwood, cedar, and mahogany; and as all these woods then brought more than ten times the market price of later years, and the value of money was far greater, the colony rose in wealth and importance, and the dignity of its local government was enhanced. The administration was by Magistrates prior to 1786,

then by Superintendents appointed by the Crown, until, in 1862, it was ruled by a Lieut.-Governor, subordinate to the Governor of Jamaica. In 1884 it was created a Crown colony.

It must be remembered that until 1798 the people were really Britons and their slaves, settled in what was admittedly Spanish territory, and not at all with the consent of Spain, nor yet with even an acquiescence on the part of the native tribes of Indians, their neighbors in Yucatan. Frequently, during the eighteenth century, the colonists had to fight for their lives; but they prospered and gained in numbers and in strength, and had an apparently firm footing in their tropical home.

It is difficult on any principle of law to justify these early adventurers in forcing a settlement in what was Spanish territory, both by discovery and conquest, and the English Government, it must be said, afforded little aid or encouragement. In 1763 the Government of Spain recognised by treaty the right of British subjects to "cut, load, and carry away," unmolested, the woods of the country, but reserving to Spain the sovereignty of the soil.

It is more than likely that this concession was granted grudgingly, for the settlers were continually annoyed by official and unofficial interference and effort to control, continued for a number of years, until, in 1798, came the ultimatum and the battle of St. George's Cay, and from September 10 of that year the colony was free from Spain, and passed wholly under the jurisdiction of Great Britain. It is impossible to understand or explain the lack of progress in the colony; but if the old Baymen who helped to win that victory in 1798 were to visit the scenes of their prowess now, a century later, about all the changes they would notice would be the new source of light, petroleum, and the vessels moving with no aid from the winds—the steamers in the harbor. All else is unchanged. Yet British Honduras is a beautiful country, rich in woods and in fruits, with a soil the most fertile and a climate with which it would be hard to be discontented; and from the similarity of its geology to that of the surrounding Republics, it is certain that it contains much mineral wealth.

Those who wish for a few quiet weeks in the tropics could find no more restful, hardly a healthier resort. There are pleasant excursions for those who are fond of sailing or of riding; but there are no wagon roads in the colony. There is frequent communication *via* Mobile and New Orleans with the United States, and by the Harrison Line to Liverpool with Europe, and as these last-named steamers touch at Vera Cruz, in Mexico, the return trip to the United States may be made through that wonderful Republic.

M. FROIDEVAUX'S PARIS LETTER.

PARIS, March 15, 1901.

My last letter contained a brief historical note of the Société de Géographie, from the time of its foundation in 1821 to the year 1900 I have now to speak of its organization, its publications, and the part which it has borne in popularizing geographical science in France.

Any one, of whatever nationality, may become a member by the payment of annual dues of 36 francs (and cost of diploma, 25 francs, single payment) after his name has been presented by two members and accepted by the Central Commission.

Women are eligible as well as men, and enjoy the same rights; that is to say, they receive free of cost *La Géographie*, the bulletin of the Société, and if they live in Paris, cards of invitation to the public meetings of the Société. Any member may purchase exemption from annual dues by the payment, once for all, of 400 francs, not including cost of diploma.

The Bureau of the Société is composed of a president, two vice-presidents, a secretary and two controllers. The Bureau is renewed every year, by election, every member having the right to vote. The Bureau includes, in addition, a treasurer and a librarian, who are elected for five years, in the same manner. Besides the Bureau there is the Central Commission or Council of the Société, charged with the whole administration and acting in the name of the Société. It is composed of thirty-six members, including the treasurer and the librarian, and is directed by a president, two vice-presidents and a secretary-general, with whom may be associated other secretaries. This Central Commission is divided into three sections: for correspondence, for publication, and for accounts (this last composed of six members). The section for correspondence (twelve members) maintains relations with the learned societies, the travellers and the geographers of other countries, while the section for publication (twelve members) is charged with everything that concerns the printing of previously unpublished books, narratives of travel, and the engraving of maps. This section decides all questions relating to the publication of *La Géographie.*

Such is the organization of the Société de Géographie, which numbers at present more than 2,000 members, and possesses its own establishment in the very centre of resources for study, not

far from the Sorbonne, the Collége de France, and most of the great Parisian libraries and the principal collections of archives. The library, which increases every day, thanks to gifts and to numerous exchanges, now contains more than 45,000 volumes, bound and unbound, more than 5,000 maps, 11,000 series of photographic views, more than 6,000 blocks for printing, and about 3,000 portraits of travellers and geographers. This library, which is opened on certain conditions to non-members, renders great services to students, and especial service to the members of the Société, who not only pursue their study in the building, but have the exclusive privilege of borrowing volumes. In the absence of a settled plan it has been found impossible to form a museum for collections made by travellers. It may, perhaps, be possible to add this *desideratum* at a later day.

From the month of June, 1822, to that of December, 1899, the organ of the Société was the *Bulletin*, the complete collection representing 134 octavo volumes, in seven series, of which the first four are provided with general analytical tables. There must be added to this collection the 18 volumes of the *Compte Rendu des Séances* for the years 1882–1899. Other publications made by the Société or under its auspices are: a *Recueil de Voyages et de Mémoires* in seven large quarto volumes; a *Guide Hygiénique et Médical des Voyageurs dans l'Afrique Intertropicale* (published in association with the Société de Médecine Pratique de Paris); an atlas of the *Fleuves de l'Amérique du Sud* from the surveys of the regretted Dr. Jules Crevaux; and the *Journal d'un Voyage en Arabie* performed in 1883 and 1884 by the unfortunate Charles Huber, published with the assistance of the Ministry of Public Instruction. To these must be joined the precious collection of *Rapports Annuels sur les Progrès de la Géographie* prepared for 25 years (1867–1892) by the honorary Secretary-General, M. Charles Maunoir, and a Map of Africa on a scale of 1:10,000,000; now in its fourth edition.

These were the publications of the Société de Géographie up to last year, since when its *Bulletin* has been replaced by *La Géographie*, at the head of which are the Secretary-General and M. Charles Rabot, the well-known explorer of the Arctic Regions. The latter gives all his care to this review, which is published monthly by Masson, in large octavo form, with maps and illustrations. I have frequently had occasion to mention articles in *La Géographie*, which is edited by a special committee, presided over by Prince Roland Bonaparte.

The Société de Géographie intends soon to publish a complete

account of the journey of M. Fernand Foureau from Algeria to the Congo by the Sahara and Lake Tchad, with the scientific results obtained; and also an atlas of surveys made in Central Asia by M. Marcel Monnier.

It is not only by these different publications that the Société aids in the progress and spread of geographical science; it also makes appropriations in aid of explorations, it awards prizes, and it provides a series of lectures regularly twice a month from the beginning of November to the end of June. The greater part of these lectures take place at the meetings, so called, of the Central Commission; others in the two annual public meetings, presided over by the Bureau of the Société; others again at the meetings called *solennelles*, which are held sometimes at the Sorbonne, sometimes at the Trocadéro. These meetings are reserved to eminent travellers whose explorations have aided in the development of the French influence and in the progress of geographical science, and the one last held was devoted to the reception of the Foureau-Lamy Mission. This same mission is the last one which the Société has aided with funds; thanks to the legacy of Renoust des Orgeries, the Société was able to pay the larger part of the cost of this important journey.

Measures are now being taken to reconstitute a Travellers' Fund, the interest of which is to be applied to the help of distant expeditions and the publication of the discoveries made; and though it is now but small in amount, this capital must, in time, suffice to meet the expenses of new scientific expeditions.

Already, for many years past, the Société has been able to offer rewards, in a certain degree, to the most distinguished travellers and scholars. Not content with encouraging geographical studies in establishments of secondary instruction and others, the Société awards every year nearly 25 prizes, or medals, many of which are furnished by special foundations. Of these prizes the one most coveted is the Great Gold Medal of the Société, reserved for the traveller who, in the course of recent years, shall have accomplished a journey of exceptional importance and value for its results; those on whom this medal is bestowed receive, if they are French, the title of Life Members, and that of Corresponding Members if they are foreigners.

Besides these prizes the Société proposes to award, in 1902, new recompenses to the winners in the competitions instituted in 1900, the purpose of which is to extend the geographical knowledge of France and its colonies. Admission to these competitions is reserved

to Frenchmen, and the text of the three subjects proposed will be found in *La Géographie* for July, 1900 (pp. 75–77).

The Société is also interested in the history of geography, as is proved by the existence of its Jomard prize, and also by the care with which it celebrates the centenary of the great explorers; the geographical work of Cook, of La Pérouse, of d'Entrecasteaux, of Mendaña, of Barentz, and of Vasco da Gama has been commemorated in special sessions of the Société.

Furthermore, the Société has been able, through the Poirier legacy in 1883, to distribute a yearly revenue to French travellers in recognition of journeys exceptionally useful to science and commerce.

Such is, briefly stated, the present organization of the Sociéte dé Géographie; and the regularity in the working of this association, which receives no appropriation from the State, does the greatest honor to Baron E. Hulot, its Secretary-General since 1897.

The latest news received of French travellers is of new geographical problems, either stated or solved by French savants and explorers.* In France, M. Bleicher, taking up a question which seemed to have been settled by Mr. W. M. Davis, contends that the Moselle never was an affluent of the Meuse, and denies that the Meurthe captured the Moselle to the detriment of the neighbouring river; in his view the floor of the Val de l'Ane is not a residue of the ancient alluvium of the Moselle mingled with the débris of landslips.† This brings up again a problem which appeared to be definitely settled.‡

In Africa many officers are at work upon surveys. Lieut. F. Dromard has made reconnoissances on the Ivory Coast, which unite the itineraries of the two missions, Woelfel-Mangin and Hostain-D'Ollone; and Dr. Cureau, in concert with a German party, is engaged in defining the limits of the French Congo and the Kame-

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* Thus, M. de Martonne, in the *Annales de Géographie* of January 15, has studied the mode of formation of the cirques, and, after giving a definition of the cirque and carefully differentiating it from similar forms (crater, torrential receiving-basin, etc.), has explained why he finds the determining cause of its formation in the glacial action. He closes his study by formulating geographical and geological conclusions, and this

general law in the chiselling of the high mountains; outside of the tectonic action and the contact of rocks of unequal hardness, every break in a slope is the mark of a line which formed during a long time the limit of two regions, in which agencies of different nature were engaged in the destruction of the relief.

† And nothing now proves the ancient passage of the Moselle through the Val de l'Ane to join the Meuse.

‡ Attention is called to M. Henri Tavernier's most interesting paper, *Etude Hydrologique sur le Bassin de la Saône*, in the *Annales de Géographie.*

run, in accordance with the treaty. *La Géographie* has also just published the results of the Mission Gendron. It was in June, 1899, that Commandant Gendron undertook to unite, by a chain of triangles and by a line of certain geographical positions, astronomically fixed, the two chief places of the French Congo, Libreville and Brazzaville. If the events on the Shari did not permit the completion of this programme, one of the party, Lieut. Jobit, was none the less able to carry out all his instructions from Libreville as far as the Alima, and an itinerary based upon ten astronomical positions was laid down with the compass. Another officer, Lieut. Loefler, has studied the region of the N'Gonnié and the Alima, and the Upper N'Gonnié and the Nyanga. An excellent map by M. V. Huot illustrates and explains these notes.

The return of M. E. Gentil's expedition to the Shari-Sangha brings the solution of the long-disputed question of the Wâm. M. Clozel, in 1895, made this river an affluent of the Shari; the Belgian geographer, M. Wauters, regarded it as the upper course of the Mpoko. It appears, from a map published in February in the *Bulletin du Comité de l'Afrique Française*, and from Dr. Huot's article in *La Géographie* for March, that the Wâm of Clozel and Perdrizet is none other than the mother-branch of the Bahr-Sara, an affluent of the Shari on the left, and in reality the Wa-Bahr-Sara and the Wâm of Perdrizet and Clozel are one and the same river. The explorer, E. Gentil, returned to Paris at the end of February, and later we shall be able to report more fully on his labours.* We shall have reports of the same kind also from Commandant Destanave, who is at the head of an expedition to the Shari.

The geographical and geodetic study of Madagascar is patiently continued. The year 1900 was fruitful in results. Father Colin, who has already done so much, hopes to determine precisely the still unsettled positions of Menajary, Farafangana, and Cape Sainte-Marie. The programme for 1901 embraces a longitudinal chain parallel to the central chain, from Majunga to Cape Sainte-Marie, and united to the coast by transverse chains; and by the end of the year 1901 the general topographical knowledge of the island will be complete. We may mention also the account published by the *Revue de Madagascar* of M. E. J. Bastard's second journey in the island, in the course of which he laid down in the Mahafaly country, to the south of the Onilahy, 500 kilometres of new itiner-

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* The same may be said with regard to Capt. Joalland, who brings back new surveys of positions on the shore of Lake Tchad and other scientific documents.

aries, in a region till then obstinately closed to the Europeans, and thus prepared the occupation of the country by the French troops.

I have already noticed the journey accomplished in 1898–1900 by M. Charles Eudes Bonin from Peking to Russian Turkistan by Mongolia, Koko-Nor, Lob-Nor, and Dzungaria. The account in *La Géographie* shows that the explorer followed a route, for the most part unknown, from Ning-Hsia to Liangchou, that he crossed the Nan-Shan by a new road and completed the orography of the country for a great distance, and that he is the first who has crossed the Tian-Shan directly from the south to the north between Kara-Shar and Umrumtchi. It is to be hoped that he will give a detailed account of his travels.

These are the principal facts in exploration since my last communication. We may note also that the lectures on Madagascar, organized at the Museum, met with very great success, and that there has just been founded in Paris a Comité de l'Asie Française, which aspires to play a part analogous to that so well performed by the Comité de l'Afrique Française.

There is always a lull in the publication of new books immediately after the holiday season, and we have still to wait for the reports of the various Geographical Congresses held in 1900. In the Compte Rendu of the session of the Institut Colonial International, held in Paris in August of last year, will be found a valuable report on Colonial Sanatoria, by Dr. G. Dryepondt.

M. Charles Lenthéric, well known by his studies of the French Mediterranean coast, has just brought out a volume on the *Côtes et Ports Français de l'Ouan* (Wan-hsien). There are good chapters in this book, to which the author might well have given a greater development.

The same remark applies to the *Statistique Générale de l'Algérie, pour les années 1897, 1898 et 1899*, filled as it is with most valuable and interesting details; it omits the roads and the manufactures of the colony, as well as the returns of commerce and navigation for 1899.

With this may be mentioned an excellent study of the European Population of Algeria by MM. G. Mandeville and N. Demontès, published in the *Questions Diplomatiques et Coloniales*, of August 15, and illustrated by nine maps. M. Gaston Dujarric presents, in *L'Etat Mahdiste du Soudan*, the detailed story of the singular and ephemeral state formed in the Sudan by the Mahdi and organized in 1885 by his successor, the Caliph Abdallah.

Two works on Asia must be noted: *Les Puissances Etrangères*

dans le Levant, by MM. Verney and Dambmann, and *La France du Levant*, by M. Etienne Lamy. In his work, *En Chine*, devoted to the south-eastern portion of the province of Chi-li, Father H. J. Leroy has brought together a mass of ethnographical information. The *Itinéraires dans l'Ouest de la Chine* are purely geographical; they show the route followed by M. Claudius Madrolle from Mongtsé to Yunnan-hsien, the Blue River, Tibet, and finally to Chingtu-fu, in 1895, together with a general map of Yunnan, giving the posts of the Chinese troops in the province, and a plan of Yunnan-hsien.

Nothing has been published on Oceania or on America; but a book which has its value for history, as well as for science and for historical geography, is not to be overlooked. This is the *Lettres Écrites d'Egypte*, by Etienne Geoffroy Saint-Hilaire, to Cuvier, Jussieu, Lacépède, Monge, Desgenettes and others, and to his family. In these letters, edited by Dr. E. T. Hamy, Geoffroy relates his impressions, and recounts the principal events of the expedition under Bonaparte, together with the meetings of the Egyptian Institute and the summary of his own scientific work.

HENRI FROIDEVAUX.

NOTES AND NEWS.

The Peary Arctic Club sent by express, on the 29th of March, to Dundee, in Scotland, the second annual mail to R. E. Peary. There are five copies of this mail, and one copy will be put on board of each Dundee whaler, to be delivered to the Eskimos at Cape York and forwarded to Mr. Peary's headquarters in Greenland.

The letters contain the news of the death of Mr. Peary's mother; of the Duke of the Abruzzi's highest north; of the Baldwin-Ziegler Arctic Expedition and the British Antarctic Expedition; and of the departure of the *Windward* from Disco last August, with Mrs. Peary and her daughter on board.

A correspondent writes:

Our school geographies for many years instructed children to pronounce the name Popocatepetl, the Mexican volcano, with "cat" accented and as though the last syllable were spelled "pel." F. P. Hoeck & Co. of the City of Mexico have written to the Board on Geographic Names that the name consists of two words. The first word, *Popoca*, is accented on the second syllable. The second word, *tepetl*, is accented on the first syllable and is pronounced as though it were spelled "Taypel." A.

It is more easy to write about names than to settle their pronunciation. Mexican scholars seem to be the authority with regard to the native words, and the statements of Alonso de Molina in the ninth chapter of his *Arte de la Lengua Mexicana y Castellana, Segunda Parte*, do not sustain the accentuations quoted by our correspondent. Molina says that the natives of Mexico do not lay stress upon one syllable more than upon another in their speech and conversation.* He notes some exceptions in the use of verbs, and adds that sometimes the final syllable is accented in vocatives.

There are thirty-five lines in the chapter, including two *Avisos*, and three lines at the end of the *Aviso Primero* give a rule which any one may apply:

it is proper to know that, when you are unacquainted with the accentuation of any word of this language, you must pronounce equally all the syllables of the word, as in *nitetlaçotla*, pronouncing these five syllables with equality of voice and tone and measure.†

Popocatepetl may well come under this rule. Pimentel says, in the

* Es de saber que comunmente, o por la mayor parte, estos naturales no alçan mas una sillaba que otra en su hablar y platicas :

† Conviene a saber, que quando ygnorares el accento de algun vocablo desta lengua, pronuncies ygualmente todas las sillabas de la diction, assi como *nitetlaçotla*, pronunciando con ygual boz, tono y medida estas cinco sillabas.

Cuadro Descriptivo y Comparativo de las Lenguas Indígenas de México (Tomo 1°, p. 166):

There are no words with an accented termination except some vocatives, and almost all (words) have the penultimate syllable long.*

It is certain, in any case, that there is no silent letter in *tepetl.* Pimentel says:

the *tl* in the middle of a word sounds as in Castilian; but at the end it is pronounced *tle*, the *e* semi-mute, that is to say, without fully pronouncing it.†

Those who do not propose to speak Nahuatl may safely follow their chosen dictionary in pronouncing the name Popocatepetl.

MAZAMAS.—The Eighth Annual Outing of this mountain Club will take place in July, at Mount Hood. The circular notice says:

Headquarters will be established at timber-line, on the south side, from July 14th to 19th inclusive. On Sunday the 14th religious services will be conducted, but there will be no restraint on those who prefer to seek enjoyment elsewhere. The four following days will be devoted to scientific field work and exploration. On Friday, the 19th, the mountain will be ascended and appropriate exercises held on the summit, where the club was organized July 19th, 1894.

A select party of scientists will leave camp Saturday morning for John Day Valley, for exploration among the fossil deposits of that region.

No one attending the outing is under any obligation whatever, either to join the club or ascend the mountain, but we would be glad to welcome to membership all who have "Climbed to the summit of a perpetual snow peak, on the sides of which there is at least one living glacier, and to the top of which a person cannot ride, horseback or otherwise."

For further information address MAZAMAS, PORTLAND, OREGON.

MR. EDWARD WHYMPER, the British Alpinist, intends to spend the coming summer with Swiss guides among the Rocky Mountains of Canada. He will endeavor to ascend a number of peaks that have not yet been climbed, and he has particularly in view Mount Assiniboine, a fine peak about twenty miles south of the Canadian Pacific Railroad. It is nearly 12,000 feet high, bears a remarkable resemblance to the Matterhorn and is apparently inaccessible on all sides. Several attempts to ascend this mountain have failed. Professor Charles E. Fay, of the Appalachian Mountain Club, says that in this region, within twenty-five miles of the Canadian Pacific Railroad, there are at least a dozen peaks whose ascent is likely to be extremely difficult. He speaks of Mount Assiniboine as offering a problem apparently more difficult of solution than was the Matterhorn before Edward Whymper discovered its secret in 1865.

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* No hay palabras de terminacion aguda si no son algunos vocativos, y casi todas tienen la penúltima silaba larga.

† la *tl* en medio de diccion suena como en castellano; pero al fin se pronuncia *tle*, la *e* semimuda, es decir, sin llegarla á pronunciar bien: (*op. cit., T. 1, p. 165.*)

THE CENSUS OF INDIA.—The London *Lancet* prints the following table of the population of India, according to the census taken on the 1st of March:

BRITISH INDIA.	
Ajmere-Merwara	476,330
Assam	6,122,201
Bengal	74,713,020
Berar	2,752,418
Bombay	18,584,496
Burma	9,221,161
Central Provinces	9,845,318
Coorg	180,461
Madras	38,208,609
Northwest Provinces and Oudh	47,696,324
Punjab	22,449,484
Baluchistan	810,811
Andamans	24,499
Total British India	231,085,132
NATIVE STATES.	
Haidarabad	11,174,807
Baroda	1,950,927
Mysore	5,538,482
Kashmir	2,906,173
Rajputana	9,841,032
Central India	8,501,883
Bombay States	6,891,691
Madras States	4,190,322
Central Provinces States	1,983,496
Bengal States	3,735,714
Northwest Provinces States	799,675
Punjab States	4,438,816
Burma States	1,228,460
Total, Native States	63,181,569
Total, all India	294,266,701

In 1891 the total for all India was 287,317,048. The population of the Native States has lost in the ten years as much as 4.34 per cent.; that of British India shows an increase of 4.44 per cent. It is estimated that the States which suffered so severely from the famine—Rajputana, Central India and the Bombay States—lost not less than 5,000,000 of their inhabitants.

THE U. S. CENSUS OFFICE has received through the Department of State a consular report on the population of Germany and its changes since 1789, when it numbered 26,000,000. In 1815 it had increased to 30,000,000; in 1845, to 34,000,000; in 1865, to 40,000,000; in 1885, to 47,000,000, and in 1900 to nearly 56,000,000.

There are now in the empire thirty-three cities with more than

100,000 inhabitants. Berlin has 1,884,346; Hamburg, 704,669; Munich, 498,503; Leipzig, 455,120; Breslau, 422,415; Dresden, 395,349; Cologne, 370,685; Frankfort-on-the-Main, 287,813; Nuremberg, 260,743; Bremen, 160,823, and Strassburg, 150,268.

Messrs. Frederik Muller & Co., of Amsterdam, have sent a most beautiful illustrated catalogue of Manuscripts and Books, to be sold by auction on the 9–11 of May.

In the second part of this catalogue, No. 1421 describes a West Indische Paskaert by Blaeuw, of the year 1639, the prototype, according to Messrs. Muller & Co., of the charts printed in the Low Countries in the Seventeenth Century for the use of navigators in the service of the Dutch West India Company.

The chart of the year 1621, published in Dr. O'Callaghan's *Documents Relative to the Colonial History of the State of New York, Vol. I.*, is declared by Messrs. Muller & Co., in their notice of No. 1421, to be a *mystification*, at least so far as the date is concerned. They say:

> The original of O'Callaghan's map, now on exhibition in the Lenox Library, is a map published by Anthoni Jacobsz, without date. O'Callaghan has reproduced only the northern part of it and has put into the reproduction a vignette foreign to the map, and the fictitious date of 1621. This is the date of the foundation of the Company, but not at all the date of the map, for on the part of it not reproduced by O'Callaghan is recorded a discovery made in 1643 by Brouwer on the coast of Chili—a discovery made public in Holland in 1646. This is shown by the name Brouwershaven on the coast of Chili in O'Callaghan's complete original map, now to be seen in the Lenox Library.
>
> The map reproduced by O'Callaghan and dated by him in the year 1621 is of a later date, and we assign it to about 1650.

In their description of the Paskaert of Anthoni Jacobsz (No. 1423) in the Catalogue Messrs. Muller & Co. add this remark:

> The vignette introduced into his reproduction by O'Callaghan is a cartouche belonging to the Dutch maps published towards 1680. Who introduced this cartouche and the date of 1621?

A question not to be answered at this late day. Dr. O'Callaghan died in the year 1880.

The place of the *Korean Repository* was taken on the 1st of January by the *Korea Review*, which will be devoted to the record of events and the discussion of all subjects relating to Korea, outside of the political arena.

The population of Korea is given in the News Calendar from the official report of the recent census, by provinces. The total (including Seoul, with 196,898 inhabitants) is 5,608,351; but the editor is disposed to think that the actual population is greater, and that

the enumeration represents only those who pay taxes to the Government.

The mediæval city of Song-do is undergoing repairs, and preliminary surveys for the northern railroad have been completed to that point.

An article on the New Century presents an interesting picture of progress and improvement in the capital and the ports of the Kingdom, though it opens with a sentence that takes away the breath of those who are not fortunate enough to live in the Land of the Morning Calm:

> As the World swings across the line that divides the Nineteenth Century from the Twentieth it finds all the civilized nations of the earth joined in a federation of amity and concord.

The editor begins in this number a history of Korea, based upon native books and manuscripts.

It does not appear how often the *Korea Review* is published, whether monthly, bi-monthly or quarterly, for the annual subscription of two dollars.

THE *Athenæum*, of April 20, has a note on Capt. Lemaire's first report on his mission to Katanga.

He found that not a single place of importance in the southern and eastern part of the Congo State had been correctly located. In the Congo-Zambezi region one important point was a degree out of its place, and well-known falls, lakes and camps along a line of 500 miles were 20 miles and more from their position on the map. The west coast of Tanganyika is brought further west, and the mouth of the Lukuga as much as 32 miles. The Lualaba branch of the Upper Congo is brought 37½ miles nearer to the great lake.

Latitude and longitude are important; but the Congo Free State, in its short life of sixteen years, has had more than enough to do.

PROF. WM. H. BREWER, of Yale University, is reported to have said in a lecture that Lieut. Eld, U. S. N., of New Haven, Conn., was the discoverer of the Antarctic Continent.

Henry Eld was a Passed Midshipman in the U. S. S. *Peacock*, one one of the vessels of Wilkes's Exploring Expedition in 1838–1842.

The *Narrative* of the Expedition says (Vol. II., p. 292):

> On board the Peacock, it appears that Passed Midshipmen Eld and Reynolds both saw the land from the masthead, and reported it to Captain Hudson:

On p. 293 of the same volume, Commander Wilkes writes:

> Two peaks, in particular, were very distinct (which I have named after those two officers), rising in a conical form;

The construction is peculiar, but the evident intention is to do justice to both men.

The date of the discovery is, according to the *Narrative*, January 16, 1840.

Herr Anschütz-Kaempfe has laid before the Vienna Geographical Society a plan for reaching the North Pole in a submarine ship of 800 tons, carrying five persons, who would be able to remain under water for 48 hours and, by the help of compressed oxygen, even a longer time. The ship would be navigated to the edge of the pack-ice and there sunk, to find its way by the compass to the next open space, and then repeat the process.

According to Payer, an opening in the ice is to be found in the European Arctic at about every marine mile; Herr Anschütz-Kaempfe will be satisfied with one in every ten miles.

The thickness of the ice is no great obstacle, for the ship can be sunk to the depth of 160 feet.

If this admirable scheme fails, all is not lost. There remains the ocean floor, on which an automobile might run to the Pole.

M. Jules Leclercq, in a report to the Académie Royale de Belgique, examines the question of the nautical school of Sagres, said to have been established by Prince Henry the Navigator, and treated as a legend in a recent memoir by Dr. Jules Mees. Dr. Mees denies also the existence of anything deserving the name of a city on the site of the Villa do Infante.

M. Leclercq calls attention to the fact, apparently overlooked, that the earthquake of 1755 overthrew not only Lisbon but other Portuguese cities, and among them Sagres and Lagos. He notes also the abiding local tradition, and is disposed to treat it with respect.

Mr. R. H. Major, in his *Prince Henry the Navigator*, affirms that the greatest Portuguese historian of our time (a rank conceded to Herculano) expresses a doubt whether it is possible to prove that the school of Sagres ever existed. M. Leclercq, in the note which closes his report, quotes a passage of a letter from a member of the Lisbon Academy to the Portuguese Minister at Brussels to this effect:

> It cannot be proved that there existed a school, in the usual and literal sense of the word, or an official naval academy, scientifically and regularly organized, but it is none the less established that the Infant Dom Henry gathered around him at Sagres all the competent men who could give him aid in his geographical, cosmographical and other work. It is to this assemblage of technical elements that the denomination of School of Sagres has always been applied.

The Portuguese Minister, the Count of Tovar, having been asked whether Mr. Major's assertion concerning the Portuguese historian was correct, assured M. Leclercq that if Herculano had made the statement referred to, it was not to be found in his History of Portugal, but must be sought for in some other work.

A REFLECTOR for concentrating the sun's rays to produce steam in order to pump water from a well at South Pasadena, California, is noticed in *Nature*, of April 11th, with this comment:

> As the skies of Southern California are remarkably free from clouds, and millions of square miles of arid lands are only awaiting the flow of water to be converted into fertile tracks, the solar motor may provide a practicable means for pumping the water, etc.

The *tracks* are undoubtedly those of the printer, but to whom do the *millions* of square miles in Southern California belong?

NINE YEARS IN THE SEA.—According to the *Sun*, of April 8, a lady of Newark, N. J., more than nine years ago, on the voyage home from England, dropped in mid-Atlantic a bottle containing her address on a telegram and the promise of a reward to the person who should return it. She received it on the 4th of April, with a letter dated Kristiansund, N. Norway, March 22, 1901.

The letter stated that the bottle had been picked up off the coast of the island of Smölen by a fisherman, who would appreciate the promised reward.

The ocean is wide and the nine years' wanderings of the bottle are matter for conjecture; but the incident is not without suggestion as to what has been called the *myth* of the Gulf Stream.

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OBITUARY.

Paul Chaix.

Prof. Paul Chaix, a Corresponding Member of this Society for more than forty-seven years, died at his home in Geneva, Switzerland, on the 28th of March, without suffering and in full possession of his rare intellectual gifts, in the ninety-third year of his age.

Paul Chaix was born Oct. 1, 1808, at Crest, in south-eastern France. In 1816 his father removed with his family to Geneva, and there his son received his equally solid and brilliant education.

He adopted the profession of teaching; lived for three years in the family of the Duke of Richmond, and for two years at St. Petersburg with the Gagarine family, and afterwards, at his home in Geneva, directed the education of several princes: Alexander of Prussia, Schwarzburg-Rudolstadt, Lippe-Detmold, Saxe-Altenburg, Mecklemburg-Schwerin, the Duke of Edinburgh, the Princesses Leuchtenberg, and Prince Anhalt.

Prof. Chaix had travelled in many parts of Europe and in Egypt.

He was Instructor in Geography and History at the Industrial College, Professor in the Gymnasium and Honorary Professor of the University of Geneva. All these positions he resigned in 1882, in view of advancing years.

His principal publications are: a Map of Savoy, an Elementary Geography and Atlas, Letters from the Banks of the Nile, a History of South America and the Hydrography of the Arve.

He was a constant contributor to geographical and other reviews, and all his writings bore the stamp of a lucid intelligence, carrying with perfect ease the acquisitions of wide and profound scholarship.

TRANSACTIONS OF THE SOCIETY.

MARCH–APRIL, 1901.

A Regular Meeting of the Society was held at Mendelssohn Hall, No. 119 West Fortieth Street, on Tuesday, March 19, 1901, at 8.30 o'clock. P.M.

Vice-President Tiffany in the chair.

The following persons, recommended by the Council, were elected Fellows:

Learned Hand.
Dr. Walter G. Chase.
John T. Williams.
Edward Sturges.
John J. Phelps.
N. Archibald Shaw, Jr.
Pinckney F. Green.
Jesse W. Potts.
Cornelius Eldert.
Timothy S. Williams.
John Tatlock, Jr.
W. F. Wyckoff.
Nicholas R. O'Connor.
Jonathan Odell Fowler, Jr.
John L. Riker.
Alfred Tuckerman.
John G. Neeser.
Lewis A. Eldridge.
Walter C. Taylor.
Frederick E. Willits.
Lewis S. Thompson.
Gouverneur Paulding, II.
Samuel B. Dana.
Captain William Crozier.
Nelson Robinson.
Dr. H. Ernest Schmid.
Dr. E. Eberhard.
William Edmond Curtis.
E. P. Chapin.
John Armstrong Faust.
William H. Bliss.
James H. Kidder.
William H. Maxwell.
Arthur von Briesen.
E. G. Kennedy.
W. A. Clark.
C. T. McFarlane.
J. Dyneley Prince.
John H. Barnard.
Samuel S. Dennis.
James Lane Allen.
Charles H. Hall.
A. H. Thayer, M.D.
George E. Fahys.

The Chairman then introduced Mr. Herbert M. Wilson, of the United States Geological Survey, who delivered a lecture on Examples of Topographic Form in the United States.

On motion the Society adjourned.

A Regular Meeting of the Society was held at Mendelssohn Hall, No. 119 West Fortieth Street, on Tuesday, April 16, 1901, at 8.30 o'clock, P.M.

Vice-President Moore in the chair.

The following-named persons were, by the Council, recommended to the Society for election to Fellowship and elected:

Samuel Mather.
Herman A. Heydt.
Thomas Sturgis.
Edward Winslow Paige.
Paul Outerbridge.
Myron A. Lockman.
Le Grand Bouker.
Dr. H. Ryniker.
George L. Carnegie.
Paul Tuckerman.
John Lloyd Thomas.
H. A. O'Leary.
Julius Robertson.
Walter Phelps Dodge.

The Chairman then introduced the speaker of the evening. Prof. Charles L. Bristol, of New York University, who addressed the Society on the Geography of Bermuda.

On motion the Society adjourned.

On the 11th of April a marble bust of Charles P. Daly, the work of Mr. William Rudolf O'Donovan, was delivered to the Council—a gift to the Society from the following gentlemen:

Edward Cooper.
John Greenough.
John A. Hadden.
Abram S. Hewitt.
Seth Low.
D. O. Mills.
J. E. Parsons.
Chandler Robbins.
F. Augustus Schermerhorn.
William C. Schermerhorn.

BULLETIN

OF THE

AMERICAN GEOGRAPHICAL SOCIETY.

Vol. XXXIII **1901.** **No. 3**

MOUNTAIN PASSES: A STUDY IN ANTHROPO-GEOGRAPHY.*

BY

ELLEN CHURCHILL SEMPLE.

We now come to the pass city, which is situated in the plains or lowlands at the foot of a pass, and which draws its support both from mountains and plains. It is located on the line of travel which always skirts the base of a mountain range, at the point where this is intersected by a transverse route of communication across the highlands. The greater fertility of the plains makes for a larger centre of population, the intersection of trade routes ensures commercial activity; hence such points offer conditions for large and flourishing cities, especially if railroads follow the two lines indicated. Such is the location of Narbonne and Barcelona at the extremities of the route over the eastern Pyrenees; Toulouse commanding the central passes, and Bayonne the western. The St. Gothard route is flanked by Lucerne on the north and Milan on the south, just as the Brenner is by Munich and Verona. Tiflis is situated in the great valley highway between the Caspian and Black Seas, but through the Pass of Dariel (7,954 ft.) to the north come the influences that make it a Russian town. Peshawar depends more upon the Khaibar Pass and its connections thereby with central Asia than upon the Indus river. Kabul, which commands the western entrance to this route, and lies on the great thoroughfare through the Pass of Bamian to Russian Turkistan, is one of the keys of India; while Kandahar, the other, occupies the point where all the routes of western and southern Afghanistan converge for the descent through the Bolan pass to the Sind. But great as is the

* Continued from BULLETIN No. 2, 1901, p. 137.

commercial and strategic importance of these cities, it sinks into insignificance in comparison with that of Herat, which commands the Heri-Rud depression leading down to Turkistan. In the twelfth century, according to a Persian historian, it had 444,000 houses and 12,000 shops. It has been attacked and destroyed fifty times, each time rising from its ruins. The Russians plan eventually to make it the terminus of the Trans-Caspian Railroad.

Where mountains follow a semi-circular course, the routes over their passes must tend to converge on the inner side. Such foci of highways are the fore-ordained sites of great commercial centres. The bazaars of Merv are fed by all the mountain routes from Meshed in Persia to Kabul in eastern Afghanistan. Khulm and Balkh draw on all the twenty or more passes over the Hindu-Kush and the Pamir, Bukhara is the focus of all the southern routes on which, in relation to itself, Merv and Khulm are only intermediary points; while with Samarkand and Tashkent it shares a position before the great valleys of the western Tian-shan. Its location would make it one of the great cities of the world were it not for the encircling desert and the scantiness of its water supply, which is tapped further up stream for the irrigation of Samarkand. In its bazaars are found drugs, dyes, and teas from India; woven goods, arms, and books from Persia; arms and fine horses from Merv; wool, skins, and dried fruit from Afghanistan, and Russian merchandise from Moscow, Nijni-Novgorod, and Orenburg. English goods, which formerly came in by the Kabul route, have been excluded since Russia established a protectorate over the province of Bukhara. Just across the highlands of central Asia, to the east, the cities of Kashgar and Yarkand occupy the centre of the vast amphitheatre formed by the Tian-shan, the Alai-tag, the Pamir, Hindu-Kush, and the Kuen-lun. Stieler's atlas marks no less than six trade-routes over the passes of these mountains from Kashgar to the head streams of the Oxus and Sir-daria, and six from Yarkand to the Oxus and the Indus. Their position is parallelled by that of Turin, which occupies the focus of all the roads over the central, western, and Ligurian Alps, commanding thus a fine sweep from Lucerne in the north around to Savona in the south.

The location of Turin is superior to that of the central Asiatic cities mentioned above, because the passes which it commands unite the two great natural waterways found in the Rhone and the Po. The accessibility, the sphere of attraction, and hence the value of all mountain passes, is determined in large part by their connection with the natural highways which are found in river

basins. The passes of the central Asiatic highlands lose much of their importance by a lack of waterways. Of the streams draining this vast upheaved area the Oxus, Sir-daria, Chu, and Ili are lost in land-locked seas or lakes; the Tarim is soaked up by the sands of the desert, and only the Indus, which merely skirts the base of this highland on its most inaccessible side, reaches the ocean. In contrast, the Alps are flanked by the Po, the Rhone, and the Danube. The passes of the Pyrenees open on one side into the valley of the Ebro, and on the other to the Garonne, with its canal extension to the Mediterranean. The Pass of Belfort is the greatest historic highway of Europe, because it unites the deep furrows of the Rhine and the Rhone. The passes of the Alleghanies, in western Pennsylvania, lead through their pass valleys to the Ohio at its head of navigation. The Mohawk depression connects the Hudson with the inland waterway of the Great Lakes, and hence, in its historical and commercial importance, is one of the most significant natural features on the North American continent. Even the far-away Yukon serves as a highway from the northern outlets of Chilkoot and White Horse Pass to the goldfields of Dawson City and Forty Mile Creek.

As the world's roads are used primarily for commerce, pass routes rank in importance according to the amount of trade they forward, and this in turn is decided by the contrast in the lands which they unite. The passes of the Alps and the Pass of Belfort are busy thoroughfares, because they effect the exchange of the products of the tropical Mediterranean and of the temperate regions of central Europe. Or, the contrast may be one of occupation. The Mohawk depression forwards the grain of the agricultural Northwest in return for the manufactured products of the Atlantic cities. The passes of the Asiatic highlands connect the industrial lowlands of India and China with the nomad uplands of Mongolia, Afghanistan, eastern Bukhara, and Russian Turkistan. Hence they facilitate the exchange of the wool, skins, camel's hair cloth, and metal work of the wandering pastors for the manufactured goods and fine agricultural products of the sedentary populations in the fertile lowlands. Where passes offer an outlet for inland countries to the sea, their sphere of attraction, and therewith their importance, is immensely increased. San Francisco, New York, Philadelphia, Marseilles, Venice, Trieste, and Karachi are seaports which owe their importance in no small degree to the great passes back of them.

Though mountain passes are pre-eminently thoroughfares for

trade, and though the purposes of trade have lent their settlements a certain common physiognomy, nevertheless war, too, has had a hand in modifying the work of nature there in making military roads and building forts, and in giving to the history of mountain passes the element of adventure to vary the monotonous tale of trade. The final ascent to the summit of high passes is oftentimes made through wild, narrow ravines, which present the greatest difficulties to the advance of an army, and predetermine the point of bitterest aggression and defense in time of war. Such is the gorge of Valsorey leading up to St. Bernard, where Napoleon encountered the greatest difficulties in his famous passage of the Alps in May, 1800, with 30,000 men; such the gorge of Cardinel, just below the Splügen Pass, where the French army, under General Macdonald, ascending this ravine in December, 1800, was struck by an avalanche, and lost a large number of its men, who were hurled into the abyss below. When Suvaroff, in September, 1799, crossed the Alps to drive the French out of Switzerland, he came up the Ticino to the dangerous Val Tremola (6,375 ft.), where he had several sharp skirmishes with the enemy, crossed the St. Gothard, forced the passage of the Urner Loch, but had a fierce fight at the Devil's Bridge, at the lower end of the gorge, and compelled the French to retreat to Lake Lucerne. Just six weeks before the Devil's Bridge had been the scene of a battle between the Austrians and French.

The same military exploits have been enacted over and over in mountain passes. The gaps in the Hindu-Kush and the Sulaiman ranges have been traversed by the conquering forces of the early Aryans, Alexander and his Greeks, Mongols, Tartars, Persians, and English; and now the Russians are ready to descend by the same routes to the Indus. Every foot of the Khaibar Pass has been fought over repeatedly, and the Ali Musjid fort, which guards it now, has been alternately held by Afghans and English. In the pass of Roncesvalles, leading across the western Pyrenees from Pamplona to St. Etienne, fell the army of Charlemagne in 778 with the flower of his knighthood; through this valley the Black Prince in 1367 led his troops to the victory of Navarrete; up this valley in 1813 moved a division of Wellington's army, driving the French before them; and by this route Soult advanced across the frontier from France for the relief of the French forces shut up in Pamplona. In the eastern Pyrenees, the Col de la Perche saw the legions of Hannibal, of Pompey, of Cæsar climbing the mountain barrier, and the repeated advance and withdrawal of French forces in the Peninsular War.

Military needs have given a certain common physiognomy to mountain passes. Artificial defences of every kind guard the approaches to the summit. Forts, castles, watch-towers, mount the heights of almost every gap in the southern Eurasian highlands from the Bay of Biscay to the Bay of Bengal. A more archaic form of defence is found in the ruins of walls built across these natural portals. The old Caucasian wall was built across the Albanian Gates in the eastern Caucasus by the Persians as a barrier to barbarian invasion from the north, and was provided with iron gates by Harun al Rashid. Strabo says that in his day the *Pylæ Caucasiæ*, or Pass of Dariel, was closed by walls and gates. The Shah el Nadir, leading from the mountains of northern Persia to the plains of Turkistan, shows formidable walls to-day. The Afghans, in their recent war with England, threw temporary barriers across the Khaibar Pass to block the advance of the English. Compare Cæsar's wall and trench, nineteen miles long, which he constructed across the depression between Mt. Jura and Lake Leman to stop the advance of the Helvetians. At the entrance to passes we find strongly fortified and garrisoned points as a base of supplies for aggression or defence in time of war. Such are Belfort, Stirling (which is the key to the Scotch Highlands); Vladikavkaz, at the entrance to the Pass of Dariel; Saverne (the Roman *Tres Tabernæ*), which defends the chief pass of the Vosges; Bayonne and Perpignan, both their fortresses the work of Vauban, which guard the eastern and western passes of the Pyrenees. Quetta, which is the chief British stronghold in the Sulaiman Mountains, is at the western outlet of the Bolan Pass, leading up from the Indus Valley; it also commands a route running west by the Kojah Pass to Kandahar, and another running north to Kabul. Some old towers standing in the vicinity of Quetta and at the entrance to the gorges attest the importance attached in all ages to this strategic position. Farther north Peshawar is the base of all military operations over the neighboring Khaibar and Paiwar Passes into Afghanistan, and northwest by the Chitral route to the passes of the Pamir.

Defensive war goes to meet the invading enemy at the frontier, and if this frontier is mountainous, the passes see the first engagements. Such was the battle of Thermopylæ. The low passes forming the outer gateways into the mountains of Switzerland have been the field of battles, small in point of the numbers engaged, but great in their significance. At Morgarten Pass, east of Lake Zug, in 1315, fourteen hundred Swiss Confederates won their first battle over their Hapsburg oppressors; and again in the same place

in 1798 the army of the Swiss Republic defeated the invading French. This spot has rightly been called the Thermopylæ of the Swiss. The battles between the Swiss and Austrians in 1386 at Sempach, which commanded an approach to Lucerne, and in 1499 at Frastanz, just south of Lake Constance, in defense of the entrance to the Upper Rhine, were of this same character. It was in the Pass of Killiecrankie that the Highland clans, supporting the deposed James II. of England, made their stand in 1689 against the army of William I. Stirling Castle, Falkirk, and Bannockburn—names great in the history of English invasion and Scotch defence—guarded the pass from the Lowlands to the Highlands.

Where the invading force succeeds in crossing the mountain barrier, it advances out of the mouth of the passes and in the plains meets the full force of the defending army—not a mere outpost, such as is often sufficient to hold a pass. Such plains, generally river valleys, from the topography of the country, become the great battle-fields of the world. It is safe to say that no other equal area on the earth has seen so many pitched battles as the valley of the Po. On its affluents, the Ticinus and the Trebia, Hannibal defeated the Roman consuls. Just west of the Ticinus at Vercellæ, Marius defeated the invading Cimbri. Five hundred years later Stilicho defeated the Goths under Alaric, who had invaded Italy by the Julian Alps, at Verona and Pollentia, two widely separated places, of which the latter commanded the entrance of the low pass south over the Ligurian Alps, now followed by the Ceva-Albenga road. In the Middle Ages, when the German Empire was trying to retain its hold on the Kingdom of Italy, the Po valley was the scene of conflicts. But this region saw its greatest conflicts when Napoleon, in May, 1800, brought his army across the Alps by the St. Bernard, the Simplon, St. Gothard, and other passes descended upon the enemy like a thunderbolt, and defeated them at Montebello and Marengo. The next few decades saw the battles of Novara, Magenta, and Solferino stain the streams of the Po. In the annals of Spain the valley of the Ebro affords a parallel to the Po in Italy. Any one who reads Napier's History of the Peninsular War sees that the activities in that great conflict were completely dominated by the passes of the Pyrenees. The first move on the part of the French was to seize all the Spanish piedmont, or mountain fortresses, like San Sebastian, Vitoria, Pamplona, Jaca, Figueras, and Barcelona, while the defences of Gerona were hammered at again and again to reduce that important point. Their communication with France secured by the possession of the passes,

the French moved forward to the Ebro, and then, in the eight years that followed, every foot of the Ebro from its source to the mouth was contested. When in the last period of the war the French began to give way, they made their last line of defence along the Ebro, whose waters ran blood once more. On their retreat over the passes across the frontier, the rivers of France—the Bidassoa, the upper Adour, and Garonne—repeated the history of the Ebro. Wellington's wonderful crossing of the tidal stream Bidassoa, the fall of the French cities Bayonne, Orthez, Tarbes, and Toulouse, placed the last eventful scenes of the war along these river valleys.

All mountain regions, like Afghanistan, the Caucasus, the Alps, and the Pyrenees, along whose base or over whose passes the great human tides of migration, trade, and war have poured, contain a motley assemblage of races, languages, dialects, customs and institutions in apparently hopeless confusion, in which, however, the anthropogeographer is able to detect an orderly arrangement. Especially is this true in the passes which have played a great part in ethnic and linguistic distribution. The fair and red-haired Teutonic type of Switzerland, limited in general by the crest of the Bernese Oberland and the Todi chain, extends south of this line in a broad but shallow wedge to the summit of the St. Gothard and Furka passes, while just beyond begins the dark Italian type and Italian speech. The Brenner, too, carries the German speech and greater height of the Teutons well over into the Adige valley as far as Bozen, where the stunted type of Mediterranean people and Italian speech begin. The lowlands on either side of the Alps are inhabited by two distinct long-headed races, the summits and remote upland valleys by the broad-headed Alpine race; the people of the pass show a cranial index intermediate between the two, indicating the intermixture of races which has taken place along this thoroughfare. The inhabitants of the Brenner are pretty much alike from Innsbruck to Bozen in cranial index, stature, coloring, and language; but remote side valleys show the unmixed Alpine race with every variety of dialect, custom, and social institution.

The passes of other mountain ranges have the same ethnic story to tell. The Pass of Belfort connects the tall, blond Germans of the Rhine with a long, narrow area of this same type, extending through this depression and down the Rhine to Marseilles and dividing two wider sections of the short, dark Alpine race. It has also exerted a marked influence on the natural history of Europe; it was the only route by which the southern flora and fauna could reach the north, since they could not cross the Alps. The two

extremities of the Pyrenees, where, as we have seen, are the best passes, show the same race of inhabitants on both the slopes. The province of Roussillon, in southern France, which commands the eastern routes to Spain, was annexed to France only in 1659. Its capital, Perpignan, in plan and architecture, is semi-moresque; and the inhabitants, in physiognomy, language, and dress resemble the neighboring Catalonians in Spain. At the other end of the Pyrenees, the Basques, whose predominantly long-headed type seems to point to their origin in Spain, occupy both slopes of the mountains; but the broad-headed Alpine race, native to southwestern France, has sent a deep wedge of its broad-headed type up the valley of the Nive and over the Pass of Roncesvalles as far as Pamplona, displacing the cranial index of the Basques, but adopting their language. In the Caucasus, the Ossetes, who hold the Pass of Dariel, are the only tribe occupying both slopes. The pass city Tiflis, at the crossroads of the two great routes between Europe and Asia, has been called the "precipitate of history." Prof. Brusch reckons seventy different languages spoken there. The great pass cities of central Asia, like Bukhara, Merv, and Tashkent, show the same feature of mixed population, embracing representatives from every country of Asia and from many of Europe, including always the ubiquitous Jew.

Those points on the earth's surface which attract the chief activities of man—travel, territorial expansion, migration, war, and commerce—must early assume political importance. Tribes inhabiting mountain passes have always been able to exert a political influence out of proportion to their size and strength; and they have also been the object of conquest by the people of the lowland. Entrenched in their mountain fastnesses, however, they have always been able to give the invaders plenty to do before the conquest has been accomplished. An old Persian proverb says: "If the Shah is too mighty, let him only make war on the Caucasus." Such mountain tribes have always exploited the advantages of their position by levying tolls. Cæsar describes a certain expedition he sent out under the command of his lieutenant to reduce three mountain tribes whose territories extended from Lake Geneva and the Upper and Middle Rhone to the summits of the Alps, and who controlled the passes traversed by the Roman merchants, *magnis portoriis et magno cum periculo.* The southern slopes of these mountains were occupied anciently by the Salassi, a Celtic tribe, who inhabited the valley of the Upper Dora Baltea and Buttier, and hence commanded the passage of the Great and Little St. Bernard,

the two most important routes from Italy to Gaul. They frequently harassed the Romans, and on one occasion plundered the coffers of Cæsar himself. After a protracted struggle this tribe was exterminated by Augustus, who founded Aosta to protect the highroads and garrisoned it with 3,000 soldiers of the Prætorian cohorts. The Afghan tribes in the passes of the Sulaiman Mountains have been accustomed to impose high transit taxes upon traders traversing those routes between western Afghanistan and India. The travellers, therefore, organize themselves into bands of hundreds, or even thousands, as protection against attack or exorbitant exactions. The Afridis have always enforced their right to impose tolls in the Khaibar and Kohat passes. Since 1880 the English have paid them a yearly sum to keep these roads open.

Mountain regions, because of their passes, are great natural transition lands, and as such have always been the object of acquisition by neighbouring powers having designs on the country beyond. They have, therefore, assumed a peculiar political character, and have been the subject of a distinct political policy, which is only to-day recognized in its full significance—since the development of the national-empire idea and its consequent territorial expansion. This policy dictates the acquisition, not, as heretofore, of a mere border range as a frontier, but of a whole mountain region. In the military operations against the chief objective in the country beyond, the rugged highlands, with their passes, form the line of communication with the rear. It is of vital importance that this line, necessarily long, difficult, and easily obstructed at its passes, should be put beyond the chance of interruption. The whole mountain country, therefore, must be conquered. The conquest, though long drawn out, because of the independent spirit and intrenched position of the upland tribes, is a foregone conclusion. The sparsity of the highland population, their tendency, geographically determined, to form small, isolated valley States, and their lack of cohesion, make their eventual defeat certain. The small States of the Pamir, Roshan, Machan, and Shugnan have lost their independence to Russia; Afghanistan, the Chitral, and Kashmir to England. Only where the sense of danger, combined with an advanced civilization, overcomes the tendency towards disunion, as is the case of the Swiss, do we find a mountain people successfully maintaining an independent State. The Alps succumbed to ancient Rome, the Tyrol to the early German Empire. Napoleon I. conquered Switzerland, and began constructing military roads over the chief passes to Italy. By the second Afghan War, the Amir became

a feudatory of the British Crown, which gained control of the foreign relations of Afghanistan, and also of its great pass routes—the Khaibar, Kohat, Kuram, and the Bolan—to Kandahar.

In all of the cases cited, military or political exigencies pointed out the necessity of securing these transition lands; but, in the history of our own country, we have an instance of the occupation of such mountain districts purely as the result of the long-sighted prevision of America's first expansionist. The man was Gov. Spotswood, of Virginia. In his time the tide-water marked the limit of English settlement. Between that and the foot of the Blue Ridge lay a fifty-mile zone of unbroken forest. The beyond was unknown. All the Mississippi valley was claimed by the French, who, in order to hold it, were pushing the construction of a line of forts, reaching from New Orleans up to Detroit and Fort Duquesne. Rumors of these activities reached Gov. Spotswood, and his mind was disturbed by the cordon the French were drawing around the English settlement. So in 1716, by way of example, apparently, he made his famous expedition across the Blue Ridge by Swift Run Gap, from the headwaters of the Rapidan into the Shenandoah Valley, of which he took formal possession in the name of the King. In his letters to the Lords of Trade regarding this expedition, he explains the power of the French settlements of the interior to monopolize the fur trade and also to threaten the English plantations in the rear. And then he adds:

> Nature, 'tis true, has formed a Barrier for us by that long Chain of Mountains w'ch run from the back of South Carolina as far as New York, and w'ch are only passable in some few places, but even that Natural Defence may prove rather destructive to us, if they are not possessed by us before they are known by them.

Then he recommends that, while it is yet possible, the English should make some settlements on the Great Lakes, and at the same time possess themselves of those passes of the mountains which should be necessary to preserve communication with such settlements.

The passes to and through such highlands are always the great objective. When a mountain State has effectively maintained its independence—as Switzerland has—and is conscious that its political importance is due to the roads it controls, it aims at the complete command of the entrances to its passes. Switzerland has succeeded in shutting Italy out from all her southern passes except the Great St. Bernard and the Splügen. The exclusive command of the St. Gothard route from lowland to lowland is secured by the wedge of Swiss territory which is driven down into Italy almost to

the plains of the Po. The same politico-geographical phenomenon is repeated just farther east in the southern approaches of the Brenner, again at the cost of Italy. But politico-geographical history in Europe has become old and staid, whereas in Asia it is only in process of making. In Asia, therefore, the evolution of the peculiar political character of these barrier areas is proceeding rapidly before our eyes. In this process Russia is the great factor, as a glance at the Russian frontier will show. To the political geographer the map of the Russian frontier in Asia is eloquent. Its distinguishing features are four great bulges, not so very pronounced when viewed in relation to the whole vast stretch of the Russian Empire; but when seen in detail and in relation to the topography, their significance becomes important. All four of these bulges have to do with mountain areas, and the accession of the territory has immediately been followed by the construction of a railroad—a fact which attests the importance which Russia herself attaches to the acquisition.

The only points at which the Russian territory extends south of the critical fortieth parallel are in Trans-Caucasus, Trans-Caspia, and the Pamir—all of them acquisitions of the past twenty-three years. The conquest of the Caucasus is geographically a conquest from Asia. Begun a hundred years ago, the frontier has been protruded, with slight interruption, southward over the Great Caucasus, the Anti-Caucasus, the Kazil-dagh (mean altitude 10,460 ft.), and to the still higher range forming the watershed between the Araxes and the Murad, the head-stream of the Euphrates. That name contains the climax of Muscovite expansion here. Along the Araxes basin three Powers converge—Persia, Turkey, and Russia; but Russia holds the lion's share, together with the best strategic points for descent on the Euphrates. Her outpost city is Kars, recently connected by railroad with Tiflis and with the port of Batum, on the Black Sea. Russia's objective is a port on the Persian Gulf, the commercial advantage of which would be enormous; on the political side, it would enable her to threaten the London-Calcutta highway in the flank. She is stamping upon the Armenian plateaux, therefore, the character of a political passway to the Euphrates, by which she hopes some day to reach the sea. If thwarted in this endeavor, she will utilize Afghanistan or Persia, and to this end is incidentally trying to gain ascendency in the councils of the Shah.

This brings us to the second bulge in Russia's frontier. The first stretch of the Trans-Caspian railroad was built, after the con-

quest of this region in 1881, along the foot of the Hasar Meshid mountains, which form the northern border of Persia; and Askabad, because of its proximity to the Persian frontier and the carriage-road thence one hundred and seventy miles over the mountains to Meshed, was made the military headquarters of Turkistan, and provided with a strong garrison and abundant stores of every kind on a war footing. Meshed is connected by a road two hundred miles long with Herat, and is the chief city of Khorassan Province, over which Russia seems to have established an indefinite but convenient protectorate. Khorassan may prove a possible passway to the Persian Gulf; but if that fails the Russians have still the Gates of Herat. The Afghan-Russian frontier line, accepted by Russia in 1872, had its termini at Sarakhs at the north-east corner of Persia, on the Heri-Rud, and at Khoja Saleh, on the Oxus, directly east of Merv. In political documents and speeches this was assumed as the boundary till 1882, when the Paropamisus gap was discovered by a Russian explorer. In March, 1884, Merv was conquered, and then began the advance on the Gates of Herat along two lines—one from Sarakhs up the Heri-Rud, ending in the occupation of the Zulfikar Pass, the Robat Pass, and other avenues to Herat; the other from Merv up the Murghab river, which irrigates the Merv oasis, to the town of Penjdeh, which commands the approach to a much-used trade route over the eastern Paropamisus, here 8,000 ft. high, by the Pass of Hasret-i-Baba (6,400 ft.), straight to Herat. The English frontier survey commission, appointed finally to investigate the Russo-Afghan boundary, left the Muscovites in possession of the hundred and twenty miles of country they had occupied. To-day, south from Merv runs the famous Murghab branch of the Trans-Caspian Railroad for a hundred and ninety miles along the Murghab river to Kushkinski Post, on the frontier of Afghanistan, only about thirty miles from the fortress of Kushk, which guards the northern outlet of the Hasret-i-Baba Pass, and eighty miles from Herat. This is a purely strategical and military line, and is kept absolutely secret. No permission to travel on it has ever been granted to a foreigner. It is not difficult to foretell the history that will be made some day in the passes of the Paropamisus.

The next bulge in the Russian boundary is formed by the rectangle of the Pamir, which seems to have been attached by one of its corners, thus forming a very erratic frontier. The Pamir is approached by the Oxus, which Russia controls, and which by its two head-streams exactly embraces the plateau. By this acquisition,

therefore, Russia holds a strategic position for descent through its passes to northern India, or to the Tarim basin of Chinese Turkistan, with its cities of Kashgar and Yarkand. On the northern border, Russia's position is still more significant. An eastern branch of the Trans-Caspian Railroad to Margljan (2,000 ft.), in Fergana, brings Russia very near to the Tarim, for by the Terek Pass her forces can drop down from the wall of the Tian-shan into the valley of Kashgaria.

The next bulge is much more important, though much more slight; but the evidence seems to indicate that the eastward protrusion of the frontier towards the passes of the Dzungaria is only begun. It is evidently aimed at Kulja, where converge all the routes from the west to join the great imperial road of China. Now Russia demands the protectorate over Mongolia and Chinese Turkistan, for which she has been preparing her routes of communication. The main line of the Trans-Caspian Railroad runs at present only to Tashkent; but its extension to Kulja will undoubtedly be a thing of the near future.

The advance of the Russian frontier towards Afghanistan immediately succeeded a similar movement of the British in India towards strategic points to the west. India's western frontier shows a decided bulge into Afghan territory, with its apex pointed towards Kandahar, whose strategic value we have seen. Here, too, as in the case of Russia, the railroad has followed on the heels of the advance. The wedge driven westward and northward up the valley of the Chitral to the base of the Hindu-Kush in 1895 was a counter-movement, called for by Russia's occupation of the Pamir. Newspaper generals and parliamentary speakers of the time declared the Chitral a strategical position of doubtful importance, and set forth at length the impossibility of any attack from the north. But the Indian officers on the ground concluded that if Russia found it worth while to be on the Pamir side of the Hindu-Kush passes, it was at least expedient for England to be stationed at the southern entrances to the same. Thus even the "Roof of the World" has gained a political importance strangely at variance with its scantiness of resources and sparsity of population.

THE TANANARIVE OBSERVATORY.

BY

W. H. HUNT.

It is an undeniable fact that if Protestant missionaries effect in new countries a great deal apart from the mere propagation of the Gospel, as was the case in Madagascar when during the early years of the last century they introduced so many of the mechanical arts, the Jesuit missionaries stand very near the head in works demanding a knowledge of the higher sciences.

The names of the Reverend Fathers Roblet and Colin will be always as intimately associated with the great African island as that of Grandidier, the distinguished French explorer. Long before the French Government took in hand the cartography of Madagascar, the Rev. Father Roblet had completed the triangulation of the two great interior provinces of the island. For the most complete tables of meteorological observations taken in Madagascar for years before the island was attracting much notice we are indebted to the Roman Catholic Mission. By a strange coincidence, I am told when the English Government, on the occasion of the last transit of Venus, sent a scientific expedition to the west coast of Madagascar to take observations, it was a Jesuit priest, Dr. Perry, who was in charge of the Mission. From the time when, more than twenty years ago, Father Roblet had traced out an enormous ellipse, chiselled in the flag-stones of the Mission courtyard at Tananarive, forming a sun-dial by the shadow of a huge iron rod thrown out horizontally from the gables of the house, to the present day of a scientifically constructed observatory, many discoveries have been made. Those who suffer damage from the periodical cyclones which visit these parts ought to be among the foremost to appreciate the value of an observatory at Tananarive. The distinguished labors of Dr. Meldrum, of Mauritius, have done so much in that direction during the past quarter of a century and more that a sister institution on this island cannot fail to be of great advantage.

A recent number of the *Revue de Madagascar* contains an interesting short notice of the observatory at Tananarive, written by Monsieur Clique, in charge of the Press service at Tamatave, and I cannot omit to give a translation of it in English, both as a side-

light upon the two pioneers of the work in Madagascar and as also worthy of notice to the scientific world in view of the invaluable services which it may eventually render:

About a mile and a half east of the capital, on a summit of a barren hill called Ambohidempona, is seen a white cupola, having the appearance of an Arab mosque. This is the new Tananarive Observatory, the only French scientific institution of its kind in the southern hemisphere. A tortuous and difficult path leading to it brings the visitor to an elevation above the sea of 1,402 metres, or more than 4,000 feet.

The present construction is quite new, the first building having been destroyed in 1895, during the war, just before the taking of Tananarive, for it is from this mountain of Ambohidempona that the first shells were thrown into the Queen's Palace. During the course of the Franco-Malagasy hostilities most of the astronomical instruments were carried off, either by orders of the Queen and her Ministers, or they were simply stolen by the natives and sold at ridiculous prices, spoiled or rendered worthless by the fools who meddled with them. A chronometer, for instance, of extreme value, the property of the Government, lent by the Admiralty, had been sold for one dollar! When, after the conquest, they could be partly recovered, very few of the instruments were intact, and a great number had to be sent to France for repairs, to replace the stolen and lost parts. In their simplicity the Malagasy imagined that the great equatorial telescope was a menacing cannon, a terrible engine of destruction, and that its stand was the gun-carriage! Orders were given to destroy everything before the arrival of the French.

It was necessary, therefore, to think of re-erecting the building. Father Colin, the enterprising founder, and the learned Father Roblet consequently appealed to the colony for help in the work. General Gallieni very judiciously replied to them, that "The Malagasy had destroyed the Observatory and the Malagasy might rebuild it"! So, one hundred impressed labourers were assigned to the task. Father Colin himself added six skilled workmen and set to work personally, and, as had been the case with the construction of the first building, he had to be by turns architect, mason, and carpenter.

The task was one of considerable difficulty. Material was hard to procure, and forced labour left much to be desired. An observatory, in fact, is not an ordinary building. For the instruments to attain perfect precision, indispensable to astronomical observations, it had to be built in such a manner that the flooring remained isolated from the walls and the pillars supporting the telescope, which, in their turn, must be placed on bed-rock. Lime was indispensable to give the desired solidity and cohesion to the materials.

Happily the foundations of the first observatory were not destroyed. They could be used for the second, and the forced labourers had only to go to the bottom of the ravines of Ambohidempona and bring up the stones which the Senegalese soldiers had rolled down to the bottom of the mountain for fun, having nothing better to do while they were camped on the ruins after the surrender of Tananarive. The building, by dint of great labor, was completed after twelve months' work. Although not of the same proportions as its predecessor, the present Observatory is none the less an important edifice, of imposing aspect. The observatory destroyed by the Hovas consisted of a central octagon twenty-five feet in diameter. Starting from the first story, it was made circular, so as to support the large dome; on three sides of the octagon were pavilions supporting towers, each supplied with a smaller cupola. The new Observatory has only one large cupola at the end of the main building. It has cost

$2,000—a sum which the Minister of Education granted as a subsidy to the Observatory.

This money spent, there still remained the cupola to be erected, and the estimate amounted to $1,200. At this very time the Geographical Society of Paris had the happy idea of awarding the Herbert-Fournet prize to the Reverend Fathers Roblet and Colin, which allowed them to devote immediately the sum to the purchase and erection of this cupola. From that time forth the Tananarive Observatory was on the way to completion, and could maintain the good reputation it had acquired since 1889 by its important meteorological, astronomical, magnetic, and geodetic statistics furnished to the scientific world.

The transportation to Tananarive of the framework of the cupola from Majunga was beset with difficulties, the immense iron work weighing nearly five tons. Father Colin, who had not forgotten the great obstacles he had to overcome in 1890, in getting up the great equatorial telescope, had recommended it to be packed in cases weighing about 100 pounds each, but this method was not practicable with the heavy framework of the cupola. General Gallieni, therefore, decided to entrust this delicate work to the artillery corps. The sections complete were enclosed in eight cases twelve feet long, and were brought up by the Majunga road on Lefebvre carts drawn by mules, the only practicable means of transportation along the whole route. The journey required two months.

But that was not all; it was now necessary to get it up. Father Colin, aided by a single workman, set to work himself hammering into shape the strained parts, so that at the end of a month the revolving dome of the observatory was in its place and in working order. The packing of the different sections of the cupola had been done while the paint was still fresh, so that the excessive temperature of the Red Sea soon had something to say to it. Father Colin, after having been machinist, had to turn painter, and re-painted the whole cupola. The Observatory, since July, 1899, could thus resume its ordinary routine of work, so long interrupted. This does not imply that the necessary outfit for the perfect working of the Observatory is complete. Father Colin is in need of numerous instruments, and has gone to France to procure them. The Tananarive Observatory possesses, besides the large equatorial telescope which Admiral Mouchez, the then Director of the Paris Observatory, procured for it in 1890, a meridian circle which works with precision, astronomical, meteorological and magnetic instruments of all kinds—seismographic, mareographic, etc.

His favorable position allowed Father Colin, in 1891, to make one of the rare observations of the passage of Mercury between our planet and the sun by establishing the exact moment when the phenomenon took place. All the cyclones which devastated the coasts and interior of Madagascar or of South Africa can be registered; and if Father Colin had only had at his disposal a rapid means of communication with Vohemar and Diego Suarez at the time of the hurricane of *December 15th last*, he might have been able to give the parts of the country concerned most valuable warning of the storm which was threatening them.

TAMATAVE, MADAGASCAR.

THE FLORA OF ST. CHRISTOPHER.

BY

WILLIAM H. ALEXANDER.

Any attempt to describe or convey a true conception of tropical flora must be more or less unsatisfactory. Here the botanist meets with such a profusion of natural beauty, and in such endless variety, that he feels bewildered; then puzzled at the odd and fantastic freaks of nature, but at last lost in admiration for this wonderful exhibition. Although death and decomposition continually occur, yet all seems to be life, so quietly and quickly does nature repair the losses. There is, apparently, no cessation in the operation of the forces concerned in plant life. While some trees bear fruit but once a year, yet many others are ever-bearing; one may see on one tree the flower and the fruit in all stages of development, from the youngest to the ripe fruit.

This article, however, is concerned only with the Flora of St. Christopher (St. Kitts), one of the Leeward Islands of the West Indies. Although the various islands of the West Indies differ among themselves as to flora, as well as in many other respects, yet a careful study of the flora of one is a most valuable preparation for the study of the others.

Relative to the fruit trees of St. Christopher, it may be said that they abound; and the best of all is that they grow wild or spontaneously on the mountains, by the highway, along the water-courses, or in the gardens, if permitted to do so. No cultivation is required except in the case of the pine. The true value of this fact will be fully appreciated by those who know the wretched poverty of the black labourers of the island. Perhaps the bread fruit (*Artocarpus incisa*) is the most valuable of all to the natives of the island, as it literally supplies them with food—"meat and bread." The fruit resembles that of the Bois d'Arc or Osage orange, and is prepared for eating simply by boiling in salt water or by baking. For days and days many of the poorest never taste a mouthful of other food. The mango (*Mangifera indica*), with its deep foliage and beautiful fruit, is valued both for its ornamental effect and its fruit. The mango and the Avocado pear are highly esteemed as fruits. The banana and the cocoanut are also valuable fruits; there is no effort, however, to raise more than enough to supply

the local demand, as is also true of most of the fruits. The growth and cultivation of the sugar-cane constitute the one and only industry of value, commercially speaking. The cassava is valued as a bread and for the starch it supplies. In fact, the island gets its starch from the cassava and the arrowroot extracted in the most primitive fashion.

Among ornamental trees and plants the cabbage palm (*Oreodoxa oleracea*), lifting its feather-like crown to majestic heights, easily wins first place in the admiration of all beholders. The heart of this tree—that is, the bud or young unfolded leaves—is very highly prized as a dish, tasting very much like the ordinary cabbage. But, owing to the great waste for such a small gain, there is a sentiment against cutting the tree. The cocoanut tree is also quite generally used as an ornamental tree, particularly along the highways and as a line of demarkation between the estates, so that they often present a striking and picturesque appearance. In fact, the palm avenues of St. Kitts are much admired by visitors. Another very interesting palm is that known as the traveller's palm. The leaves of this branch out fan-like, and from their base, when pierced, a quantity of water flows; from which fact the tree gets its name.

Much more might be said about the fruit and ornamental trees of this island. Then, too, there are the marvellous ferns, about which many things might be said; but, after all is said, a true conception of the bewildering and exquisite beauty of a St. Kitts fernery is impossible.

It ought to be said that the following list is not offered as absolutely complete, but it is confidently believed to contain all the important plants. The greatest number of omissions is believed to be in the timber of the mountains, as it was not practicable to get a complete list of specimens for classification.

Then, again, as botanists do not all agree, there may arise in the minds of some a doubt as to the correctness of certain classifications, but it is claimed that that given below rests on good authority. Of course, mistakes are not only possible but very probable in work of this kind.

The vernacular names given in the list are such as one actually hears in the island, and may often differ from those in use in other of the British West Indies, or in botanical or other books.

The uses specified are the ones to which the plants are applied in St. Christopher, although they may be applied to other and more important uses in other places. In the case of the medicinal plants, only those that are recognized in some pharmacopœia or in commerce

are included in this list, as it would otherwise assume very large proportions. The people attach importance to a great number of plants for their medicinal properties.

The writer wishes to acknowledge, with due appreciation, the kind, generous, and invaluable services of Dr. W. J. Branch, of this island, in the preparation of this article. Dr. Branch has lived long on the island, and has not failed to use his eyes and learning in all matters pertaining to St. Kitts.

The numbers prefixed to certain of the plants refer to the notes at the end of the list.

LIST OF THE PRINCIPAL ECONOMIC PLANTS, INDIGENOUS OR INTRODUCED, THAT ARE NOW, JANUARY, 1901, IN ST. CHRISTOPHER, WEST INDIES.

CLASS I.—DICOTYLEDONS.

NATURAL ORDER.	SCIENTIFIC NAME.	VERNACULAR NAME.	USE.
Anonaceæ—	Anona muricata	Sour Sop	Fruit
	Anona squamosa	Sugar Apple	Fruit
	Anona reticulata	Custard Apple	Fruit
	Anona cherimolia	Cherimoyer	Fruit
Menispermaceæ	Cissampelos Pareira	Velvet Leaf	Medicine
Nymphæaceæ—	Nymphæa alba	Water Lily	Flower
Cruciferæ—	Nasturtium officinale	Water Cress	Food
	Cochlearia armoracia	Horse Radish	Food
	Brassica oleracea	Cabbage	Food
	Brassica rapa	Turnip	Food
	Sinapis nigra	Mustard	Food
	Sinapis alba	Mustard	Food
	Raphanus sativus	Radish	Food
(1)	Cleome pentaphylla	Missambi	Food
	Moringa pterygosperma	Horse Radish Tree	Food
Violaceæ—	Viola odorata	Violet	Flower
	Viola tricolor	Pansy	Flower
Canellaceæ—	Canella alba	Canella	Medicine
Bixineæ—	Bixa Orellana	Roucou	Food and Dye
	Flacourtia Ramontchi	Governor Plum	Fruit
Caryophylleæ—	Dianthus Caryophyllus	Carnation (2)	Flower
Guttiferæ—	Mammea americana	Mammy Apple	Fruit
Malvaceæ—	Hibiscus phœniceus	Dwarf Hibiscus	Flower
	Hibiscus mutabilis	Changeable Hibiscus	Flower
	Hibiscus mutabilis var. flore pleno	Double Changeable Hibiscus	Flower
	Hibiscus schizopetalus	Tassel Hibiscus	Flower
(3)	Hibiscus Rosa-Sinensis	Large Red Hibiscus	Flower
	Hibiscus Sabdariffa	Sorrel	Food
	Althæa rosea	Hollyhock	Flower
	Abelmoschus esculentus	Ochroe	Food
	Abelmoschus moschatus	Musk Ochroe	Perfume
	Gossypium herbaceum	Cotton	Fibre
Bombacineæ—	Eriodendron anfractuosum	Silk Cotton	Ornamental Tree
	Carolinea princeps	Carolinea	Ornamental Tree

NATURAL ORDER.	SCIENTIFIC NAME.	VERNACULAR NAME.	USE.
Sterculiaceæ—	Theobroma Cacao	Chocolate	Food
	Cola acuminata	Cola	Food
Tiliaceæ—	Sloanaea jamaicensis	Break Axe	Timber
	Triumfetta rhomboidea	Mahat (Mahae)	Fibre
Rhamneæ—	Colubrina ferruginosa	Iron Wood	Timber
	Colubrina reclinata	Mawbee	Food
	Zizyphus Jujuba	Dunk	Fruit
Erythroxyleæ—	Erythroxylon coca	Erythroxylon	Medicine
Oxalideæ—	Oxalis acetosella	Wood Sorrel	Flower
Malpighiaceæ—	Malpighia punicifolia	Cerise	Fruit
	Galphimia glauca	Galphimia	Flower
Zygophylleæ—	Guaiacum officinale	Lignum Vitæ	Medicine & Timber
Geraniaceæ	Geranium sanguineum	Scarlet Geranium	Flower
	Pelargonium graveolens	Otto of Rose Geranium	Perfume
Balsamineæ—	Impatiens noli-me--tangere	Balsam	Flower
	Impatiens sultani	Sultana Balsam	Flower
Tropeoleæ—	Tropæolum majus	Nasturtium	Flower
Rutaceæ—	Quassia amara	Quassia	Medicine & Flower
	Picræna excelsa	Bitter Ash (Simaruba)	Medicine
	Xanthoxylum clava Herculis	Yellow Harklis	Timber
Aurantiaceæ—	Murraya exotica	Citronella	Flower
	Triphasia trifoliata	Myrtle Lime	Fruit
	Citrus Limonum	Lemon	Fruit
	Citrus bigaradia	Bitter Orange	Fruit
	Citrus decumana	Shaddock	Fruit
	Citrus Pompelmous decumanus	Pumple Nose	Fruit
	Citrus Pompelmous racemosus	Grape Fruit	Fruit
	Citrus nobilis var. minor	Tangierine	Fruit
	Citrus aurantium	Sweet Orange	Fruit
(4)	Citrus aurantium var. spinosissima	Lime	
Burseraceæ—	Bursera gummifera	Budge Gum	Gum & Timber
Meliaceæ—	Melia sempervirens	Lelock	Flower & Timber
	Swietenia mahagoni	Mahogany	Timber
	Cedrela odorata	West Indian Cedar	Timber
Ampelideæ—	Vitis vinifera	Grape	Fruit
Sapindaceæ—	Melicocca bijuga	Chenip	Fruit
	Blighia sapida	Akee	Food
Terebinthaceæ—	Anacardium occidentale	Cherry (Cashew) (5)	Fruit
(6)	Mangifera indica	Mango	Fruit
	Spondias dulcis	Golden Apple	Fruit
	Spondias purpurea	St. Kitts' Plum	Fruit
	Spondias mangifera	Chili Plum	Fruit
	Spondias lutea	Hog Plum	Fruit
Leguminosæ—	Indigofera anil	Indigo	Dye
	Indigofera tinctoria	Indigo	Dye
	Sesbania ægyptiaca	Sesbania	Flower & Fibre
	Agati grandiflora	Æschynomene	Flower
	Agati grandiflora var. alba	White Æschynomene	Flower
	Abrus precatorius	Crab-eye	Medicine & Ornamental Seed
	Cajanus indicus	Pigeon Pea	Food
	Arachis hypogæa	Pinders	Food

NATURAL ORDER.	SCIENTIFIC NAME.	VERNACULAR NAME.	USE.
	Clitoria ternatea	Blue-bell	Food
	Clitoria ternatea var. flore pleno	Double Blue-bell	Food
	Mucuna pruriens	Cow Itch	Medicine
	Dolichos unguiculatus	Increase Pea	Food
	Dolichos sphærospermus	Black-eye Pea	Food
	Lablab vulgaris	Bonny Vis	Food
	Lablab leucosperma	Moonshine	Food
	Phaseolus perennis	Lima Bean	Food
	Phaseolus vulgaris	Common Bean	Food
	Canavalia gladiata	Canavalla Bean	Food
	Faba vulgaris	French Bean	Food
	Pisum sativum	Green Pea	Food
	Erythrina corallodendrum	Coral Plant	Flower
	Lonchocarpus violaceus	Spanish Ash	Timber
	Andira inermis	Wild Olive	Flower & Timber
	Myrospermum frutescens	Myrospermum	Fruit
	Hæmatoxylon campechianum	Log Wood	Medicine, Dye, Flower & Timber
	Parkinsonia aculeata	Jerusalem Thorn	Flower
	Guillandina bonduc	Nicker	Ornamental Seed
	Guillandina bonducella	Nicker	Ornamental Seed
	Guillandina glabra	Nicker	Ornamental Seed
	Cæsalpinea regia	Flamboyant	Flower
	Cæsalpinea pulcherrima	Barbados Pride	Flower
	Libidibia coriaria	Divi Divi	Tannen
	Cassia fistula	Cassia Fistula	Medicine & Flower
	Cassia obovata	Bly Dog (Senna)	Medicine
	Cassia alata	Roman Candle	Flower
	Tamarindus indicus	Tamarind	Fruit
	Hymenæa courbaril	Locust	Flower
	Bauhinia variegata	Napoleon's Cocked Hat	Flower
	Adenanthera pavonina	Circassian Seed	Ornamental Seed
	Desmanthus virgatus	Mimosa	Ornamental Seed
	Mimosa pudica	Shame Bush	Sensitive Leaf
	Acacia Lebbeck	Ladies' Tongue	Timber
	Calliandra Saman	Saman	Ornamental Tree
	Inga laurina	Soldier Wood	Timber
Chrysobalaneæ—	Chrysobalanus Icaco	Fat Pork	Fruit
Rosaceæ—	Rosa rubiginosa	Sweet Briar	Flower
	Rosa lævigata	White Rose	Flower
	Rosa damascena	Damask Rose	Flower
(7)	Rosa semper florens	Ever-bearing Rose	Flower
	Rubus alpinus	St. Kitt's Strawberry	Fruit
Saxifrageæ—	Hydrangea hortensis	Hydrangea	Flower
	Bryophyllum calycinum	Wonder of the World	Flower
	Vereia crenata	Verea	Flower
Rhizophoreæ—	Rhizophora Mangle	Hydrangea	Flower
Combretaceæ—	Quisqualis indica	Quisqualis	Flower
	Terminalia Catappa	West Indian Almond	Fruit
	Combretum laxum	Combretum	Fruit
	Bucida capitata	Yellow Saunders	Timber
Myrtaceæ—	Myrtus communis	Myrtle	Ornamental Plant
	Psidium guayava	Guava	Fruit
	Psidium montanum	Guava	Fruit
	Psidium pyriferum	Spice Guava	Fruit

NATURAL ORDER.	SCIENTIFIC NAME.	VERNACULAR NAME.	USE.
	Psidium cattleianum	Chinese Guava	Fruit
	Psidium acaule	Guava Berry	Fruit
	Caryophyllus aromaticus	Clove	Food
	Jambosa vulgaris	Pome Rose	Fruit
	Jambosa malaccensis	Malacca Apple	Fruit
(8)	Eugenia acris	Bay Leaf	Perfume
	Eugenia barbadensis	Clove Cherry	Fruit
	Syzygium Jambolanum	Java Plum	Fruit
	Eucalyptus globulus	Blue Gum Tree	Medicine
	Eucalyptus obliqua	Gum Tree	Medicine
(9)	Eucalyptus rostrata	Red Gum Tree	Medicine
	Coroupita surinamensis	Canon Ball Tree	Flower & Timber
	Punica granatum	Pomegranate	Fruit
	Punica granatum var. alba	White Pomegranate	Fruit
Lythrarieæ—	Lawsonia inermis	Mignonette (Henna)	Flower
	Lawsonia alba	Mignonette	Flower
	Lagerstroemia indica	King of Flowers	Flower
	Lagerstroemia flos reginæ	Queen of Flowers	Flower
Passifloreæ—	Passiflora laurifolia	Belle Apple	Fruit
	Passiflora maliformis	Conch Apple	Fruit
	Passiflora fœtida	Love in a Mist	Fruit
	Passiflora quadrangularis	Granadilla	Fruit
	Tacsonia sanguinea	Scarlet Passion Flower	Flower
	Carica Papaya	Poppoi (Pawpaw)	Fruit
Cucurbitaceæ—	Cucumis melo	Musk Melon	Fruit
	Cucumis sativus	Cucumber	Food
	Cucumis anguria	Gherkin	Food
	Lagenaria vulgaris	Bottle Gourd	Making cups
	Cucurbita maxima	Pumpkin	Food
	Cucurbita pepo	Squash	Food
	Sechium edule	Choko	Food
	Luffa acutangula	Punch Strainer	Making strainers
	Luffa ægyptiaca	Luffa	As a sponge
	Citrullus vulgaris	Water Melon	Fruit
Begoniaceæ—	Begonia gigas	Begonia	Flower
	Begonia nitida	Begonia	Flower
	Begonia hydrocotylifolia	Begonia	Flower
	Begonia Ingrami	Begonia	Flower
	Begonia fragrans	Begonia	Flower
(10)	Begonia hirsuta	Begonia	Flower
Cactaceæ—	Melocactus communis	Turk's Head	Ornamental Plant
	Opuntia ficus indica	Prickly Pear	Dye & Food
	Opuntia Tuna	Prickly Pear	Dye & Food
	Opuntia coccinellifera	Sweet Prickle	Food for Cochineal Insects
	Epiphyllum truncatum	Epiphyllum	Flower
	Pereskia aculeata	Barbados Gooseberry	Fruit
	Cereus triangularis	Green Snake	Fruit
	Cereus flagelliformis	Small Green Snake	Fruit
	Cereus grandiflorus	Large Cereas	Fruit
Umbelliferæ—	Foeniculum vulgare	Fennel	Food
	Anethum graveolens	Dill	Medicine
	Petroselinum sativum	Parsley	Food
	Apium graveolens	Celery	Food
	Daucus Carota	Carrot	Food
Araliaceæ—	Aralia Guilfoylei	Aralia	Ornament

NATURAL ORDER.	SCIENTIFIC NAME.	VERNACULAR NAME.	USE.
	Panax filicifolium	Angelica (Seng)	Ornament
	Panax victoriæ	Angelica (Seng)	Ornament
	Hedera Helix	English Ivy	Ornament
Caprifoliaceæ—	Lonicera flava	Honeysuckle	Flower
	Sambucus nigra	Elder	Flower
Rubiaceæ—	Rondeletia speciosa	Rondeletia	Flower
	Mussaenda flaveola	Mussaenda	Flower
	Ixora coccinea	Red Ixora	Flower
	Gardenia floribunda	Cape Jessamine	Flower
	Gardenia floribunda var. flore pleno	Double Cape Jessamine	Flower
	Coffea arabica	Coffee	Food
	Coffea liberica	Liberian Coffee	Food
	Coffea stenophylla	Blue Mt. Coffee	Food
Compositæ—	Zinnia elegans	Zinnia	Flower
	Bidens Coreopsidis	Coreopsis	Flower
	Chrysanthemum sinense	Chrysanthemum	Flower
	Lactuca sativa	Lettuce	Flower
	Aster chinensis	Michaelmas Daisy	Flower
	Solidago virgaurea	Golden Rod	Flower
	Dahlia variabilis	Dahlia	Flower
	Guillardia bicolor	Guillardia	Flower
	Helianthus annuus	Sunflower	Flower
	Calendula officinalis	Marigold	Flower
	Tagetes patula	French Marigold	Flower
	Tanacetum vulgare	Tansy	Medicine
	Artemisia Absinthium	Wormwood	Flower
Ericaceæ—	Pernettya mucronata	Pernettya	Ornamental Plant
Plumbagineæ—	Plumbago capensis	Plumbago	Flower
	Plumbago rosea	Red Plumbago	Flower
Myrsineæ—	Ardisia coriacea	Ardisia	Ornamental Plant and Flower
Sapotaceæ—	Chrysophyllum Cainito	Star Apple	Fruit
	Sapota Achras	Sapodilla	Fruit
	Bumelia retusa	Ballata	Fruit
Jasmineæ—	Jasminum officinale	Jessamine	Fruit
Oleaceæ—	Olea europæa	Olive	Fruit
Apocynaceæ—	Tabernæmontana jasminoides	Tabernemontana	Flower
	Tabernæmontana cristata	Ladies Smock	Flower
	Dipladenia Harrisii	Dipladenia	Flower
	Vinca rosea	Pink Periwinkle	Flower
	Vinca rosea var. alba	White Periwinkle	Flower
	Vinca rosea var. ocellata	Red Eyed Periwinkle	Flower
	Nerium Oleander	South Sea Rose	Flower
	Nerium odorum	Blush Oleander	Flower
	Nerium odorum var. alba	White Oleander	Flower
	Alstonia venenosa	Alstonia	Flower
	Allamanda cathartica	Allamanda	Flower
	Allamanda Hendersoni	Big Allamanda	Flower
	Cryptostegia grandiflora	West Indian Rubber	Flower
(11)	Roupellia grata	Cream Fruit	Flower
	Plumeria rubra	Red Franchipah	Flower
	Plumeria alba	White Franchipah	Flower
Asclepiadeæ—	Stephanotis floribunda	Stephanotis	Flower
	Hoya carnosa	Wax Plant	Flower
Polemoniaceæ—	Phlox Drummondii	Phlox	Flower
Convolvulaceæ—	Pharbitis Learii	Purple Convolvulus	Flower

NATURAL ORDER.	SCIENTIFIC NAME.	VERNACULAR NAME.	USE.
	Ipomœa Quamoclit	Creeping Pink	Flower
	Ipomœa Quamoclit var. alba	White Creeping Pink	Flower
	Ipomœa bona-nox	Moon Flower	Flower
	Ipomœa Horsfalliae	Horsfallia	Flower
	Ipomœa Nil	Morning Glory	Flower
(12)	Ipomœa batatas	Sweet Potato	Food
	Ipomœa dissecta	Noyau Vine	Perfume in liqueur
Boragineæ—	Myosotis arvensis	Forget-me-not	Flower
	Heliotropium europæum	Heliotrope	Flower
	Cordia Sebestena	The Red Cordia Tree	Flower
	Cordia Sebestena var. lutea	Yellow Cordia Tree	Flower
	Cordia Sebestena var. fulvo-aurea	Orange Cordia Tree	Flower
	Cordia nitida	White Clammy Cherry	Flower
	Cordia Collococca	Clammy Cherry	Food for Poultry
Solanaceæ—	Nicotiana Tabacum	Tobacco	Tobacco
	Datura Stramonium	Night Shade	Medicine
	Datura Tatula	Purple Night Shade	Medicine
	Datura Metel	Night Shade	Medicine
	Brugmansia candida	Angel's Trumpet	Flower
(13)	Lycopersicum esculentum	Tomato	Food
	Petunia nyctaginiflora	Petunia	Flower
	Cestrum nocturnum	Lady of the Night	Flower
	Capsicum frutescens	Nigger Pepper	Food
	Capsicum baccatum	Bird Pepper	Food
	Capsicum annuum var. longum	Lady Finger Pepper Chili	Food
(14)	Capsicum angulosum	Barbados Bonny Pepper	Food
Scrophularineæ	Browallia elata	Browallia	Flower
	Brunfelsia americana	Rain Plant	Flower
	Antirrhinum majus	Snap Dragon	Flower
	Angelonia salicariæfòlia	Purple Angelonia	Flower
	Angelonia salicariæfolia var. alba	White Angelonia	Flower
	Russelia juncea	West Indian Heath	Flower
	Maurandia Barclayana	Maurandia	Flower
Utriculariæ—	Utricularia montana	Utricularia	Flower
Gesneraceæ—	Gloxinia speciosa	Gloxinia	Flower
	Tydæa amabilis	Tydea	Flower
	Tydæa picta	Tydea	Flower
	Besleria americana	Besleria	Flower
Bignoniaceæ—	Bignonia reptans	Barbados Queen of Flowers	Flower
	Tecoma stans	Trumpet Flower	Flower
	Tecoma capensis	West Indian Honey-suckle	Flower
	Tecoma leucoxylon	White Cedar	Ornamental Tree
	Crescentia Cujete	Cup Tree (Calabash)	Cups and Timber
Acanthaceæ—	Thunbergia grandiflora	Thunbergia	Flower
	Thunbergia alata	Thunbergia	Flòwer
	Meyenia erecta	Purple Meyenia	Flower
	Meyenia erecta var. alba	White Meyenia	Flower
	Sanchezia nobilis	Sanchesia	Flower
	Graptophyllum hortense	Graptophyllum	Ornament
	Graptophyllum hortense var. carneum	Graptophyllum	Ornament

NATURAL ORDER.	SCIENTIFIC NAME.	VERNACULAR NAME.	USE.
	Graptophyllum hortense var. bicolor	Graptophyllum	Ornament
	Eranthemum nervosum	Blue Eranthemum	Flower
	Eranthemum bicolor	Eranthemum	Flower
	Eranthemum nigrum	Eranthemum	Flower
	Eranthemum purpureum	Eranthemum	Flower
	Fittonia argyroneura	Fittonia	Flower
Pedalineæ—	Martynia diandra	Cock's Spur	Flower
Verbenaceæ—	Verbena Lamberti	Verbena	Flower
	Citharexylum cinereum	Fiddle Wood	Flower
	Duranta Plumieri	West India Laburnum	Flower
	Duranta Plumieri var. alba	White Laburnum	Flower
	Petrea volubilis	Petrea	Flower
	Clerodendron fallax	Clerodendron	Flower
	Clerodendron Thomsonæ	Clerodendron	Flower
	Clerodendron Balfouri	Clerodendron	Flower
Labiatæ—	Ocimum basilicum	Basil	Food
	Salvia splendens	Salvia	Flower
	Salvia lætea	White Salvia	Flower
	Lavandula stœchas	Lavender	Perfume
	Rosmarinus officinalis	Rosemary	Perfume
	Mentha piperata	Peppermint	Medicine
	Origanum majorana	Sweet Marjoram	Medicine
	Pogostemon sp. (?)	Patchouly	Perfume
Nyctagineæ—	Mirabilis dichotoma	Four o'clock	Flower
	Bougainvillæa spectabilis	Bougainvillea	Flower
Polygonaceæ—	Antigonon leptopus	Pink Corallita	Flower
	Antigonon leptopus var. flore pleno	Double Corallita	Flower
	Coccoloba uvifera	Seaside Grape	Fruit
Amarantaceæ—	Gomphrena globosa	Bachelor Button	Flower
	Gomphrena globosa	White Bachelor Button	Flower
	Celosia cristata	Cock's Comb	Flower
	Celosia argentea	White Cock's Comb	Flower
	Amaranthus pyramidalis	Prince of Wales Feather	Flower
	Alternanthera mutabilis	Border Plant	Ornament
	Iresine Erbstii	Box	Ornament
Chenopodiaceæ—	Beta Rapa	Beet	Food
	Basella alba	Indian Spinach	Food
Myristiceæ—	Myristica moschata	Nutmeg	Food and Medicine
Laurineæ—(15)	Persea gratissima	Avocado Pear (15)	Fruit
	Oreodaphne coriacea	Loblolly	Timber
	Camphora officinarum	Camphor	Medicine
Moreæ—	Morus nigra	Mulberry	Fruit
	Ficus carica	Fig	Fruit
	Ficus nitida	Barbadoes Evergreen	Ornamental Plant
	Ficus laurifolia	Bearded Fig	Ornamental Plant
	Ficus elastica	India Rubber Tree	Rubber
	Artocarpus incisa var. apyrena	Bread Fruit	Fruit
	Artocarpus incisa var. nucifera	Bread Nut	Fruit
	Maclura tinctoria	Fustic	Dye, Timber & Fruit
	Pilea muscosa	Lace Plant	Ornamental Plant
Casuarineæ—	Casuarina equisetifolia	Casuarina	Timber
Euphorbiaceæ—	Phyllanthus nivosus	Snow Plant	Ornamental Plant
	Croton Eluteria	Cascarilla	Medicine

NATURAL ORDER.	SCIENTIFIC NAME.	VERNACULAR NAME.	USE.
(16)	Croton variegatus	Croton	Ornamental Plant
	Hura crepitans	Sand Box	Ornamental Plant
	Hippomane mancinella	Manchineel	Timber
	Ricinus communis	Castor Nut	Medicine
	Ricinus viridis	Castor Nut	Medicine
	Poinsettia pulcherrima	Devil's Handkerchief	Ornamental Plant
	Acalypha tricolor	Acalypha	Ornamental Plant
	Acalypha marginata	Acalypha	Ornamental Plant
	Euphorbia splendens	Crown of Thorns	Flower
	Manihot utilissima	Cassava	Food
Aristo-	Manihot Aipi	Roasting Cassava	Food
lochiaceæ—	Aristolochia gigas	Giant Aristolochia Plant	Flower
	Aristolochia trilobata	St. Kitts Pitcher	Flower
	Aristolochia elegans	Aristolochia	Flower
Piperaceæ—	Piper nigrum	Black Pepper	Food
Coniferæ—	Thuya occidentalis	Arbor vitæ	Ornamental Plant
	Araucaria excelsa	Norfolk Island Pine	Ornamental Tree
	Araucaria imbricata	Monkey Puzzle	Ornamental Tree
Cycadaceæ—	Cycas revoluta	Sago	Ornamental Plant

CLASS II.—MONOCOTYLEDONS.

NATURAL ORDER.	SCIENTIFIC NAME.	VERNACULAR NAME.	USE.
Cannaceæ—	Maranta arundinacea	Indian Arrow	Food
	Canna tous-les-mois	Tous-les-mois	Food
	Canna coccinea	Plantain Shot	Flower
	Canna lutea	Yellow Plantain Shot	Flower
	Canna speciosa	Canna	Flower
Zingiberaceæ—	Costus afer	African Lily	Flower
	Zingiber officinale	Ginger	Medicine
	Curcuma longa	Dye Ginger (Turmeric)	Food
	Alpinia nutans	Shell Plant	Flower
Musaceæ—	Heliconia Bihai	Wild Plantain	Flower
	Heliconia psittacorum	Yellow Wild Plantain	Flower
	Musa sapientum	Fig (Banana)	Food
	Musa chinensis	Dwarf Banana	Food
	Musa paradisiaca	Plantain	Food
Bromeliaceæ—	Ananassa sativa	Pine Apple	Fruit
	Æchmea fulgens	Æchmea	Flower
	Pitcairnia bromeliæfolia	Pitcairnia	Flower
Orchideæ—	Dendrobium Pierardi	Dendrobium	Flower
	Dendrobium druidum	Dendrobium	Flower
	Dendrobium moschatum	Dendrobium	Flower
	Dendrobium spectabile	Dendrobium	Flower
	Epidendrum ciliare	Rock Lily	Flower
	Epidendrum nutans	Epidendrum	Flower
	Epidendrum cochleatum	Epidendrum	Flower
	Epidendrum fragrans	Sweet Epidendrum	Flower
	Cattleya Mossiæ	Cattleya	Flower
	Phaius grandifolius	Ground Orchid	Flower
	Vanda teres	Vanda	Flower
	Aërides affine	Ærides	Flower
	Stanhopea grandiflora	Ladies' Slipper	Flower

NATURAL ORDER.	SCIENTIFIC NAME.	VERNACULAR NAME.	USE.
	Oncidium papilio	Butterfly Orchid	Flower
	Oncidium luridum	Oncidium	Flower
	Oncidium montanum	Yellow Bee	Flower
	Oncidium Lanceanum	Cedros Bee	Flower
	Oncidium sp. (?)	Crater Lily	Flower
	Oncidium ampliatum	Big Yellow Bee	Flower
	Oncidium altissimum	Oncidium	Flower
	Brassia maculata	Brassia	Flower
	Ionopsis maculata	Ionopsis	Flower
	Vanilla planifolia	Vanilla	Flower
Irideæ—	Gladiolus communis	Gladiolus	Flower
Amaryllideæ—	Crinum australe	Tiger Lily	Flower
	Pancratium caribeum	White Lily	Flower
	Pancratium guianense	Curly Lily	Flower
	Eucharis amazonica	Eucharist Lily	Flower
	Amaryllis equestris	Red Lily	Flower
	Amaryllis tubispatha	Snow Drop	Flower
	Apiastrum Solandrifolium	Solander's Lily	Flower
Liliaceæ—	Lilium Harrisii	Water Lily	Flower
	Polianthes tuberosa	Tube Rose	Flower
	Polianthes tuberosa var. flore pleno	Double Tube Rose	Flower
	Yucca gloriosa	Yucca	Flower
	Agave americana	Corretah	Flower and Ornamental Plant
	Fourcroya cubensis	Sisal	Fibre
	Sansevieria zeylanica	Sansisvera	Fibre
	Aloe barbadensis	Aloes	Medicine
	Allium porrum	Leek	Food
	Allium sativum	Garlic	Food
	Allium ascalonicum	Shallot	Food
	Allium scorodoprasum	Rocky Bolt	Food
	Allium schœnoprasum	Chives	Food
	Allium cepa	Onion	Food
	Asparagus officinalis	Asparagus	Food
	Asparagus plumosus	Plumosus	Ornamental Plant
	Dracæna draco	Dragon's Blood	Ornamental Plant
	Dracæna australis	Green Dracæna	Ornamental Plant
	Dracæna fragrans	Sweet Dracæna	Flower
	Dracæna terminalis	Pink Dracæna	Ornamental Plant
Dioscoreaceæ—	Dioscorea alata	Red Yam	Food
	Dioscorea sativa	White Yam	Food
Hypoxideæ—	Curculigo sumatrana	Curculigo	Ornamental Plant
Palmæ—	Areca alba	Areca Palm	Ornamental
	Areca rubra	Areca Palm	Ornamental
	Hyophorbe verschaffelti	Hyophorbe Palm	Ornamental
	Oreodoxa oleracea	Cabbage Palm	Ornamental
	Caryota saccharifera	Sugar Palm	Ornamental
	Caryota urens	Maiden Hair Palm	Ornamental
	Corypha Taliera	Talipot Palm	Ornamental
	Euterpe montana	Mountain Cabbage	Food
	Dypsis madagascariensis	Dypsis	Ornamental Plant
	Thrinax argentea	Thatch Palm	Ornamental Tree
	Thrinax radiata	Thatch Palm	Ornamental Tree
	Rhapis flabelliformis	Cane Palm	Ornamental Plant
	Livistona chinensis	Chinese Fan Palm	Ornamental Tree

NATURAL ORDER.	SCIENTIFIC NAME.	VERNACULAR NAME.	USE.
	Phoenix dactylifera	Date	Food
	Cocos nucifera	Cocoanut	Food
	Acrocomia sclerocarpa	Mocko Palm	Ornamental Seed
	Stevensonia grandifolia	Golden Palm	Ornamental Tree
Pandaneæ—	Pandanus utilissimus	Screw Pine	Ornamental Tree
	Pandanus Beechii	Pandanus	Ornamental Tree
Cyclanthaceæ—	Carludovica Plumieri	St. Kitts Sarsaparilla	Ornamental Twiner
Aroideæ—	Monstera pertusa	Button Hole Bush	Ornamental Twiner
	Monstera deliciosa	Monstera	Fruit
	Anthurium macrophyllum	Wild Tobacco	Ornamental Plant
	Xanthosoma sagittifolium	Xanthosoma	Ornamental Plant
	Dieffenbachia seguine	Dumb Cane	Ornamental Plant
	Dieffenbachia maculata	Dieffenbachia	Ornamental Plant
	Colocasia esculenta	Scratchy Eddoes	Food
	Colocasia sagittifolium	Tanier	Food
	Arum macrorrhizum	Roasting Eddoes	Food
	Alocasia bicolor	Allocasia	Ornamental Plant
	Alocasia metallica	Allocasia	Ornamental Plant
	Alocasia macrorrhiza	Seven Years	Food
	Caladium sagittæfolium	Colalue	Food
	Caladium maculatum	Caladium	Ornamental Plant
Smilaceæ—	Smilax officinalis	Sarsaparilla	Medicine
Pontederiaceæ—	Eichhornia azurea	Water Lily	Flower
Commelinaceæ—	Campelia zanonia	White Campelia	Flower
	Campelia zanonia var. lutea	Cream Campelia	Flower
	Campelia purpurea	Resurrection Lily	Flower
	Commelina zebrina	Striped Commelyna	Flower
	Tradescantia discolor	Oyster Lily	Flower
Cyperaceæ—	Cyperus alternifolius	Cyprus	Ornamental Tree
Gramineæ—	Andropogon schœnanthus	Lemon Grass	Perfume
	Vetiveria arundinacea	Cuscus Grass	Perfume
	Erianthus saccharoides	Wild Cane	Ornamental Grass
	Saccharum officinarum	Sugar Cane	Food
	Sorghum vulgare	Guinea Corn	Food
	Sorghum saccharatum	Chinese Sugar	Food
	Panicum variegatum	Striped Grass	Ornamental Grass
	Panicum jumentorum	Guinea Grass	Fodder
	Paspalum conjugatum	Sour Grass	Fodder
	Zea Mays	Indian Corn	Food
	Coix Lachryma	Job's Tears	Ornamental Seed
	Bambusa arundinacea	Bamboo	Wood and Ornamental Plant.

CLASS III.—ACOTYLEDONS.

NATURAL ORDER.	SCIENTIFIC NAME.	VERNACULAR NAME.	USE.
Filices—	Anemia adiantifolia	Flower Fern	Ornamental Plant
	Lygodium volubile	Vine Fern	Ornamental Plant
	Hymenophyllum sericeum	Bees Wing Fern	Ornamental Plant
	Adiantum cuneatum	West India Maiden Hair	Ornamental Plant
	Adiantum cuneatum var. farleyense	Farleyense Fern	Ornamental Plant
	Pteris argyrata	Silver Snake Fern	Ornamental Plant
	Blechum occidentale	Pink Fern	Ornamental Plant
	Gymnogramma chrysophyllum	Gold Fern	Ornamental Plant
	Asplenium myriophyllum	Parsley Fern	Ornamental Plant
	Nephrolepis exaltata	Herring Bone Fern	Ornamental Plant
	Aspidium macrophyllum	Bread Fruit Fern	Ornamental Plant
	Cyathea arborea	He German Dru (Tree)	Ornamental Plant
	Asophila ferox	She German Dru (Fern)	Ornamental Plant
	Hemitella macrophylla	Gigantic Fern	Ornamental Plant
Lycopodiaceæ—	Selaginella flabellata	Emerald Fern	Ornamental Plant
	Lycopodium cornuum	Stag-Horn Fern	Ornamental Plant

NOTE.—There are about three hundred species of ferns in St. Kitts. Those given have been selected as samples of this sort of plant on account of size or special beauty.

NOTES.

(1) A purple variety of Cleome pentaphylla is also met with here.

(2) There are several varieties of pinks and carnations in the island. When well-known cultivated flowers of many varieties and different colors occur in this list, their variations will not again be specially noted.

(3) There are many hybrids of the genus Hibiscus in St. Kitts, many of which are ranked as separate species by some florists.

(4) Considered by some persons a distinct species and called Citrus Limetta.

(5) There are two varieties; one with red and the other with white fruit.

(6) There are many varieties of mango; some with poor, others with delicious fruit.

(7) Roses abound in St. Kitts. New hybrids are constantly being introduced.

(8) Seems to be a variety of Eugenia buxifolia.

(9) Several species of Eucalyptus have been introduced into the island within the last few years, but only two or three have flowered as yet.

(10) Hybrid begonias, wild and cultivated, abound in St. Kitts.

(11) It flowers very freely but bears no fruit in St. Kitts.

(12) There are many varieties of the sweet potato of very different degrees of merit. The "Mother Kitty" of St. Kitts weighs 12 pounds.

(13) Several sorts are cultivated here.

(14) There are several other varieties of Capsicum in the island.

(15) There are two or three kinds of avocado pears here.

(16) The number of hybrid crotons, already very great, rapidly increases by importation and origination in St. Kitts.

BERMUDA (*alias* SOMERS ISLANDS).

HISTORICAL SKETCH.*

BY

J. MAXWELL GREENE.

The date of the discovery of these Islands by Europeans is somewhat obscure. Juan Bermudez' name has been given to the group on the authority of Oviedo (de la natural Hystoria de los Indios, Toledo, 1576), as follows (Eden's translation):

"In the yeare 1515, when I came first to enforme Your Majestie of the state of things in India, and was the yeare following in Flanders, in the time of your most fortunate successe in these Your Kingdoms of Arragon and Castile, whereas at that voyage I sayled above the Island Bermuda, otherwise called Garza, being the furthest of all the Ilands that are found at this day in the world, and arriveing there at the depth of eight yards of water, and distance from the land as far as the shot of a piece of ordinance, I determined to send some of the ship to land, as well to make search of such things as were there, as also to leave in the Iland certaine hogs for increase. But the time not serving my purpose by reason of contrarie winde, I could bring my ship no nearer the Iland; being twelve leagues in length and six in breadth and about thirtie in circuit, lying in the three and thirtieth degree of the north side. While I remayned here I saw a strife and combat betweene these flying fishes and the fishes called giltheads and the fowles called sea mewes and cormorants, which surely seemed unto me a thing of as great pleasure and solace as could be devised. While the giltheads swam on the brim of the water, and sometimes lifted their shoulders above the same, to raise the flying fishes out of the water to drive them to flight and follow them swimming to the place where they fell, to take and eate them suddenly. Againe, on the other side, the sea mewes and cormorants take many of these flying fishes, so that by this meanes they are neither safe in the Aire nor in the water. In the selfe same perill and danger do men liue in this mortal life, wherein is no certaine securitie, neither in high estate nor in lowe. Which thing surely ought to put us in remembrance of the blessed and safe resting place which God hath prepared for such as love him who shall acquiet and finish the trauailes of this troublesome world, wherein are so many dangers and bring them to that Eternall life where they shall find eternal security and rest."

The terms of this narrative imply a stay of some slight duration, which is to be inferred also from the approximation with the dimensions given. The object of the visit plainly was to leave a herd of hogs. The presence of these animals subsequently in the Islands may be accounted for by the numerous wrecks which occurred before that of Sir George Somers.

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* Mainly taken from the *Memorials of the Discovery and Early Settlement of the Bermudas, etc.*, by Maj.-Gen. J. H. Lefroy. 2 vols. London, 1877–79.

In the rare book (three copies only are known to exist in the United States) by Peter Martyr, the *Legatio Babylonica*, published in 1511, a map is given called *La Bermuda*, the genuineness of which is placed beyond a doubt by the text being continued at the back of it.

We are forced, therefore, to conclude that if Juan de Bermudez was the discoverer, as Herrera plainly states, and as the association of his name with the group implies, he must have found them on a previous voyage. He gave no narrative of his own on the subject, and we are indebted to Oviedo for a description.

Herrera says, "They call it the Isle of Bermuda, and by another name, 'Garza,' because the captain who discovered it was called Juan Bermudez." (Historia General, Madrid, 1601; 1st Edi.)

Tradition has it that Bermudez was wrecked on the reefs and that the ship's company were saved, together with many hogs.

The earlier-coined money of the country was stamped with a hog, evidencing a belief that this tradition was founded on fact.

The accounts given of the discovery of the Bermudas must have been favorable, for we learn from Herrera (under date 1527) that Hernando or Ferdinando Camelo, a Portuguese, native of the Azores, learning that the King was desirous of peopling the Island of Bermuda, offered to convey thither, within four years, a goodly number of people, and to raise seeds, flocks, and plants upon certain conditions. The proposal came to nothing, but it has given rise to a local belief that some mutilated initials, with the figures 1543 (which are still to be seen) cut on a rock in Smith's Parish, are a visible proof that Camelo visited the Islands and carved his name there with the date.

Herrera gives in his narrative the details of the contract or agreement.

The treaty provided for the settlement and planting of the Islands, with many conditions and privileges, among which was one to obviate the difficulty of having a settlement solely of Spanish and Portuguese; leave was granted to take in settlers not belonging to these realms. Taxes, including that of Alcavala or taxes on sales of lands, were to be remitted for 20 years, excepting tithes, which for these 20 years were to be divided into five parts; the first for His Majesty, the second for the present or future Bishop or Prelate of the Islands, third for the work of the Church, the two remaining for the said Camelo, to whom the King gave them conditionally for the good-will he showed in establishing the colony, and similarly granted him after the 20 years a tenth part of the tithes

forever. He was given the title of Governor and Captain General of the Islands for life, and that of the son he should appoint conjointly with the person nominated by the King to apportion the lands and houses of the settlement as most expedient according to the quality of the settlers, arranging the same with equity and rectitude, so that no person should be aggrieved thereby.

The above-mentioned advantageous treaty was entered into very readily, for the Island of Bermuda, being 3000 leagues from Castile and 200 leagues from San Juan de Puerto Rico, to the westward, and being uninhabited and being made for by all the fleets and vessels coming from the Indies, it was desirable it should be inhabited, so that there could be found a roadstead and also assistance for so long a voyage, and to ascertain if, with people inhabiting it, a remedy could be found for the tempests there encountered, caused by the great dampness owing to its dense woods; and, notwithstanding the great advantages given, no settlement had been made in the said Island, which, owing to the bad weather there found, sailors had recourse to with great caution.

The Island was called Bermuda or La Garza (the heron) because the captain who discovered it was called Juan Bermudez and his vessel La Garza.

The Islands are mentioned in the Mappa Mundi of Sebastian Cabot, published in 1544 as *Y^a de demonios.* The evil reputation they acquired so early is in itself a proof that they were, in one sense, well known long before their settlement. In the imperfect navigation of those days they served as a landmark for the galleons bound to Spain, which ran through the Florida Channel, following the Gulf Stream as far as latitude 33°, and then steered an easterly course for the Azores. There can be no doubt that many a vessel sighted the Bermudas to her destruction. We have one such instance preserved by Admiral Sir William Monson, who died in 1643, and whose naval tracts were published in 1745, in Churchill's Collection:

> I knew about 50 years since, he says, one Captain *Russel*, a *Frenchman*, shipwrecked on that island. They managed to patch up a boat and so escaped to Newfoundland.

Captain John Smith, in his *General History of Virginia*, 1629, speaks of a visit to Bermuda, and says: "Our men found divers crosses, pieces of Spanish monies here and there," and that the island was overgrown with weeds and plants of several kinds, as "many tall and goodly cedars, infinite store of Palmetoes, numbers of Mulberies, wild olive trees, with divers others unknown both

by name and nature," and also many wrecks. The loss of a French vessel—name not known, commanded by M. de la Barbotière, in 1593—is recounted at length and with great detail by Henry May, an English sailor, who was on board. (See Hakluyt, Vol. IV., 1811, pp. 55–6.)

His narrative is valuable principally to the student of geology as illustrating the gradual subsidence of the Island. He says, "they were cast away on the Northwest part of the Isle of Bermuda and were saved in a boat and a raft," and describes the cliffs as "high," though distant from the land. These "cliffs," as May calls them, or reefs, were then some feet above water, whereas now there are only a few points above water at the lowest spring tide.

Purchas' map, published in 1625, confirms May's statement. It shows that three distinct islets have now disappeared along the line of the northern reefs. The "North Rock," some 14 feet high, and some smaller rocks near it, are all that remain to attest the accuracy of these early descriptions.

In the Record Office in London is preserved the original of Sir George Somers' narrative of his shipwreck, addressed to the Earl of Salisbury, and first published by Major-General Lefroy—

a narrative—he writes—every way worthy of that heroic age when the deeds of Englishmen so far transcended the accounts they left of them.

Sir George says that after having left England bound for Virginia, and when about 200 leagues from the Bermudas,

wee weare taken with a verie greate storme or hurricane which sundred all the fleete & on St. Jame's daye beinge the 23 of Julie (1609) wee had such a leake in our ship insomuch that there was in her 9 ffoote of water before wee knewe of any such thinge we pumped with ii pumpes and bailed in iij or iiij places with certaine Barrackoos & then wee kept 100 men alwaies workinge night and daie from the 23rd vntill the 28th of the same Julie being ffridaie, at which time we saw the Iland Bermuda wheare our ship liethe upon the rocke a quarter of a mile distant from the shoare wheare wee saved all our lives and afterwards saued much of our goodes.

From this date, July 28th, 1609, the party of 140 souls—men and women—remained until the 12th of May following, and during the time two children were born, one—a boy—being named "Bermudas," and the other—a girl—being called "Bermuda." With infinite pains the shipwrecked people succeeded in building two small vessels, and in them they embarked on the 12th May, 1610, arriving off Point Comfort (or Cape Henry) on the 28th of the same month.

There are three other accounts of this expedition, and all agree in praise of the courage and skill of Sir George Somers and of his marvellous endurance. Sir Thomas Gates and Captain Newport,

who were on board the *Sea Vulture*, as the ship was called, are also warmly praised.

The arrival of this company in Virginia was at the time of the famine in that colony. Smith says that Lord De la Ware, hearing of "what plenty there was of hogs and other good things in the Bermudas, was desirous to send thither to supply his necessary occasions." Sir George Somers thereupon volunteered to go for them, and set sail in his cedar ship of about 30 tons upon the 19th of June, and after a long and stormy passage reached his destination. No date is to be found of their arrival.

Sir George Somers, worn out by incessant labour, care, and anxiety, and being past middle age, succumbed, and, after a short illness, "in the very place we now call St. George's town, this noble knight died, whereof the place taketh its name." His men, dismayed at the loss of their leader, disobeyed his last injunctions, and set sail for England, carrying with them their great leader's body, embalmed. This was buried with all hononrs, as befitting his high estate, at Whit Church, Dorsetshire. His heart was buried in what is now the port of St. George's, and over the reputed spot General Sir J. H. Lefroy, Governor of Bermuda in 1876, erected a tablet to commemorate the fact and in testimony to the virtue and bravery of the "heroic Admiral, Sir George Somers."

Out of the ship's company three men remained in charge of the Island, who, having found ambergris (one lump weighing fourscore pounds, with other small pieces), were desirous of returning to Virginia, but were prevented by the arrival of a ship from England, under Captain Matthew Somers, nephew of Sir George Somers, who was of the ship's company with Sir George. This gentleman had persuaded some of the Virginia Company that it might be beneficial to the plantation in Virginia to settle the Bermudas. Accordingly, a charter was obtained from King James 1st (March, 1612), and 120 gentlemen detached themselves from the Virginia Company and formed a company under the name and style of "The Governor and Company of the City of London, for the plantation of the Somers Islands." On the 28th of April, 1612, the first ship was sent out with 50 emigrants under the charge of Richard Moore, who was appointed Governor of the colony. This ship was met by the three men referred to as having been left on the islands, and was safely conducted to anchorage.

Governor George Moore applied himself diligently to the work of fortifying the island. He established his residence at Saint George's, and there built a town. Before the close of 1615 six ves-

sels had arrived, bringing 340 people, among whom was a merchant and one Bartlett, who was sent out to survey and divide the colony into tribes or shares for allotment. This survey, by order of the Governor (whose name seems to have been omitted in the list), was not made. The work was afterwards done by Richard Norwood.

Governor Moore's time having expired in 1615, he returned to England, leaving the colony to be governed by six persons, who were to rule each in turn one month. The first ruler was Charles Caldicot, who sailed for the West Indies to procure plants and cattle. Unfortunately, the vessel was wrecked, and the company were rescued by English pirates from the desert island on which they had been cast away.

The affairs of the little colony now went wrong, through dissension and scarcity of food. Too much time had been occupied in making fortifications, too little in planting, and as a consequence there were few crops grown. The company in England, when this was known, sent out Daniel Tucker as Governor—a stern and determined man and a hard master. He was the first Governor under the Bermuda Company, incorporated in June, 1615, with letters patent from James the First. Governor Tucker, by vigorous measures, compelled the people to work for the Company. He issued rations of food, and paid for labour in a brass coin which bore on one side a hog and on the reverse a ship. (These coins are now become scarce and command a high price.) He also sent to the West Indies for plants and fruit trees, which grew and multiplied. The same vessels which brought them also brought the first slaves —an Indian and a negro.

Governor Tucker's term was marked by harshness, if not cruelty, and during the time there were many attempts made to escape from the colony, some of which were successful. He, fearing recall, returned to England in 1619, leaving one Miles Kendall to act as his deputy. Governor Kendall appeared to be satisfactory to the people; but being a mild, unenergetic man, he was recalled after a few months' tenure of office, and was succeeded by Nathaniel Butler, who arrived with 500 people, thus increasing the number of the population to 1,000. This number was increased by 500 more in the three years of Governor Butler's rule. Under him, in 1620, the first general assembly was held, consisting of the Governor, Council, bailiffs, burgesses, secretary, and clerk. Most of their acts were creditable to the new legislators. It is also interesting to note that the Puritan spirit of opposition to the Established Church was beginning to manifest itself in the colony. To ease their con-

sciences, the Governor himself translated the Guernsey and Jersey liturgies into English, and this, with certain modifications and omissions, seemed to quiet the scruples of those who were beginning to be Nonconformist at heart.

This Governor built the State House and many well-constructed forts and three bridges. Captain John Smith's history, published in 1624, had a map and illustrations of these buildings. It is interesting to note that at this date, 1620, Bermuda had already several buildings and forts of stone, substantial and even handsome, and that the English had only one settlement in North America—that of Jamestown. Plymouth, up to that date, had not been settled, nor Boston, until some ten years later.

The delusion of a belief in witchcraft seems to have developed in Bermuda somewhat earlier than in the other colonies. In the chronicles there are records of trials for witchcraft and of heresy trials of Quakers, who had fled persecution on the Main to encounter it again in the Islands.

The affairs of the little colony were not easy to conduct. The Company in England were dissatisfied that so little profits were realized, and, as the number of colonists increased, opposition to the claims of the Company grew and strengthened, rendering it always a difficult matter for the Governors to keep peace among the people. Religious controversy also added to the general discontent. Nevertheless, the population grew, and, to a certain extent, the people prospered. To their credit it must be said, schools had been established at an early date, with land grants for the maintenance of the teachers.

Negro slaves had been brought in since 1630 and up to 1660 from Africa and the West Indies, and there were also Indian slaves, prisoners of the Pequot and King Philip wars. Stringent laws were in force regarding vagabonds, who were compelled to labour.

During many years there continued a barter trade with vessels from the West Indies for fruits and cedar. This profitable trade was arbitrarily interfered with by the Company, as was also that of whaling—one of the leading industries—to the great detriment of the settlers.

Governor Butler retired in 1622, and for a period of twenty-five years the records are very defective. The Governors were repeatedly changed, and it is chiefly by their attestations to deeds and documents that the order of their succession can be traced.

In 1647 Captain Thomas Turner became Governor, his short term of office being at a most turbulent period. The spread of the

Puritan movement in England had been reflected intensely in the little colony, and religious dissension was rife amongst the people. Governor Turner, instructed by the Home authorities to administer the oath of supremacy and allegiance to His Majesty, proceeded to do so, and was met by stern opposition by a large number of the settlers, who were accordingly imprisoned. In a short time the prison became full—to overflowing—and on the Governor offering to liberate this class of prisoners they refused to leave and had to be forced back to their homes.

The records of this period reveal a most unhappy condition of affairs in the Somers Islands, although their trade and commerce seemed to be all the time prospering.

In 1649 Governor Turner resigned his office owing to the distracted condition of the public, and Mr. John Trimmingham, who had risen in arms against the Independence party, was elected by the people as Governor. His continuance in office was, however, but for a few months, for in 1650 Captain J. Jennings succeeded him, and was in turn—within the year—succeeded by Captain Josias Fforster.

There is reason to believe that in the distractions of the Civil War the plantation was left much to itself, and that some of these changes were brought about by party struggles.

During this stormy period there were many instances of persons being punished for treasonable conduct towards His Majesty.

It seems that the majority of the colonists were loyal to the King, as seen by their letters to the Company and sundry proclamations. At a meeting of all the members of the Council and many colonists, held July, 1649, at a private house, a proposition was made that all the inhabitants be compelled, under full penalty of the law, to take the oath of supremacy and allegiance. Then follows the indignant protest at the *horrid slayinge of the Kinge.* Immediately after a meeting was held of the Governor and Council, at which it was declared

> that wee doe acknowledge the high born Charles, Prince of Wales, to be heir to the crowne . . . after the decease of his royal father, and wee doe hereby declare and utter, we detest and dissent that horrid Act of Slayinge his Majtie, and by the oath wch wee have taken wee shall beare faith and alleadgiance to the Lawfulle Kinge of England, his heirss and successors.

This provoked discussion and dissent among the many who sympathized with the Parliamentary party in England, and many arrests followed, with imprisonments.

It is a singular coincidence that at this time George Washing-

ton, a resident colonist, was prosecuted for treasonable words. He was granted leave of appeal in England, and as his name does not appear again it is probable that he was sent thither.

On March 17th, 1651, the Governor and Deputy of the colony are ordered by the Council of State to cause all letters, declarations, and other papers received by certain ships from Bermuda to be brought to the Council for their perusal, the island having been declared by Parliament to be in rebellion. This order was modified, and letters were permitted, provided they were solely on business transactions. Certain restrictions as to election in the Company were also made at the time.

The people of the colony—or its governing class, the Royalists—did not seem to have comprehended that they were in rebellion to the established power of the Commonwealth. The surrender of Barbados on the 13th Jany., 1652, after a three months' blockade, could not fail to have been known to them and to have influenced their actions, but there is no reference to the subject in the minutes of Council.

That the little body of settlers in Bermuda should have been so misinformed of the magnitude of the force they were opposing as to have thought it possible for a moment to sustain the Royal cause unaided is much more surprising than their prudent submission to the Commonwealth when it became plain that it was established. Accordingly, on February 25th, of the same year (1652), the Governor, Josiah Fforster, and the Council assembled and the general letter sent from the honourable Company, with the orders of Court, were read.

That this act was favorably received, and that the oath of allegiance to the Commonwealth was taken, is most probable, although the chronicles of the time say little or nothing concerning it. The Committee for America reported to the Council of State, October 7th, 1656, upon the state of the Islands in reference to their constitution, governing powers, fortifications, militia, etc., and recommended that the government of the Company be again vested by patent in certain select persons approved by His Highness and the Council of State, and that the government remain at present in the hands of those in power, etc. This report did not interfere with the Company's government to any extent, and apparently no further interference in their affairs was attempted, or if so, no record of the same appears.

The next item of importance is the receipt of a letter signed "in the name and by order of the Council of William Jones, President,"

addressed to Wm. Sayle, Esq., Governor of Bermudas, dated Whitehall, Sept. 4th, 1658, announcing the death on September 3d, 1658, of the Lord Protector, together with a proclamation of the succession of the most noble, illustrious Lord the Lord Richard, eldest son of his said late Highness, etc., etc. Also setting forth the publishing and proclaiming of the said succession, and requesting that the Council and magistrates announce to the people of the colony the said information, according to a form sent for that purpose, which was accordingly done.

This letter was received by Governor Fforster, Governor Sayles not arriving in Bermuda until some time in January, 1659.

The next record of interest is the receiving of an order from the Company dated London, September 3d, 1660, to proclaim the accession to the throne of His Majesty Charles the Second. It reads in part as follows:

> The more especiallie that in Solemne manner His Most Excellent Maiestie, Charles the second, be, throughout the Islands, proclaimed King of England, etc., etc., and
>
> that the oathes of allegiance and Supremacie be taken by You, the Governr and Councell and all Officer, Civill or Military, and all and everie other person or psons within the said Islands, according to Lawe.

Then follow instructions as to setting up the King's Arms, of Assizes, etc.

According to Lefroy, the reign of Charles the Second was characterized in Bermuda, as elsewhere, by a great social deterioration, not only in morals, but in education and public spirit.

From this time on there seems to be little of consequence to note. There is the story of the usual bickerings and strife on secular and religious affairs, but there was a universal dissatisfaction with the rulings and government of the Company that finally resulted in the triumph of the settlers, for on November 27, 1684, upon the proper representation of their grievances, judgment was given against the Company or Charter, and a Colonial Government was established in 1687. Sir Robert Robinson was made the first Governor under the Crown, and was appointed by the Crown.

The former system of government was now changed. The Crown not only appoints the Governor, but also the Colonial Secretary, Chief Justice, Attorney-General, and Receiver-General, who is also the Registrar. The Assistant Judges are appointed by the Governor. The Legislature, over whose sittings the Governor presides, consists of a Council of nine members, and the House of Assembly, the latter elected by the freeholders. There are also

the usual Courts of Justice. This system is based upon the theory of the Government of Great Britain. With certain modifications, the system obtains at this date.

The interval before the establishment of the new form of government for a long period is filled with stirring incidents of fights on the sea to protect the colony from the French and Spaniards, and of the movements of commercial enterprise, and in 1710, the Spaniards again having occupied Turks Island (making prisoners of the people), the Bermudians, at their own expense, sent out a force under Captain Lewis Middleton to regain possession of the Cays. The expedition was successful, but it was found necessary, in order to ensure safety from such attacks, to arm the trading vessels. The Bermudians had always held Turks Island, and had created and maintained a large business in the production of salt. They also successfully undertook the subjugation of the rendezvous of pirates on the Bahamas; five captains and 140 men were captured, and were brought to Bermuda.

It is said that many acts of piracy were perpetrated by the Bermudians. This may be true. In those early days, when the mother country was continually at war, privateering easily and naturally degenerated into piracy. Lefroy relates that Capt. John Wentworth, said to have been an official of the government, being at that notorious haunt of the buccaneers, the Salt Tortuga, in 1665, and having heard that war had broken out between England and Holland, and getting knowledge of the existence of a certain Dutch plantation on Tortola which he thought might be worth plundering, landed accordingly with his crew, made prisoner a planter who called himself Lord of the Island, seized a brigantine, and proclaimed King Charles the Second! When he left the island he carried off 67 negro slaves, whom he took to Bermuda. The Dutchman, who was released at St. Eustatia, made a vigorous remonstrance, and even threatened to invade Bermuda; but the bearer of his hostile missive was put into prison, and the threat was not executed.

The complaint was taken up by the Company in England, and, after much correspondence, the capture was pronounced illegal, the negroes declared to be a royalty, and, by a striking application of the old fable of the oyster, seized for the use of the colony.

From the earliest days the colonists had established schools for their children, but there was little opportunity of obtaining anything like a higher education. Those who could afford it sent their

elder sons abroad for schooling, but the greater part of the youth remained at home with but a rudimentary training.

Doctor Berkeley, Bishop of Cloyne, whose memory is cherished in the United States as a sometime resident in Newport, Rhode Island, and for his literary and philanthropic works, endeavoured to found a college in Bermuda in the year 1725. Unfortunately, the plan was not realized. His college was to supply not only the needs of the colony itself, but also those of the West Indian Islands.

The Rev. Mr. Lyttleton in 1765 again revived the proposed College and Grammar School scheme. His subscription list showed a very handsome amount, and he received assurances of encouragement and support from various islands of the West Indies, but although he had been promised assistance by the Legislature, now that his plan was matured they treated his memorial coldly, and it was ordered in 1773 to lie on the table for consideration.

There is a striking similarity between the cases of Dr. Berkeley and Mr. Lyttleton. Both appear to have been men actuated by the best motives, and both failed, not from any want of exertion on their part, but from a lack of punctuality in those who ought to have furthered their plans in every possible way.

The discontent in the American provinces had at length broken out into open opposition to the Crown, and as the usual supplies from those places were in a great measure cut off, the Bermudians were often much distressed for provisions. Possibly, the almost exclusive cultivation of tobacco, which had always been their principal crop for export, had, in a measure, impoverished the soil, while too little land and time had been given to the cultivation of food crops. At any rate, the people had largely depended for their food supplies on the American colonies.

At this time James Bruere was Governor, and his term, extending from 1764 to 1780, was marked by disorder, financial distress, and almost open rebellion, perhaps not altogether to be charged to misrule, but to the disturbing nature of great events now taking place on the neighbouring continent. Forbidden to trade with their late fellow-subjects, suffering for want of food, distressed by the fact that many of them possessed near relatives and friends engaged in the struggle, matters were, at this period, in a truly deplorable condition with the Bermudians, and everything tended to destroy their good feeling towards the British Government. These circumstances must be considered duly in order to judge fairly of the

following transaction, which has always been regarded as one which had left a stain upon the patriotism and loyalty of the colonists.

General Washington had taken command of the Continental Army at Cambridge, Mass., July 3, 1775, two weeks after the battle of Bunker Hill, and after the affair at Concord. Boston was reduced to a state of siege, and, in short, civil war had broken out with all its horrors.

The General, on taking command, notified the President of Congress, and in his dispatch he stated his great need of ammunition. A few weeks later he wrote to Governor Cooke of Rhode Island, exhorting him to send out two small armed vessels in the province to Bermuda, to bring back a store of powder known to exist there.

The letter was acted upon. Captain Abraham Whipple agreed to engage in the affair, provided that Gen. Washington would give him a certificate under his own hand that, in case the Bermudians would assist in the undertaking, he would recommend to the Continental Congress to permit the exportation of provisions from the colonies to those islands.

General Washington accordingly sent an address to the Bermudians, to be conveyed in these vessels, exhorting them to furnish the needed powder—known to be stored in a secluded place on the Islands—and giving at length the motive that Bermuda, settled by the same people as the more northern colonies, and with just the same aspirations for a greater freedom, should unite with them to make the supreme effort to attain it. The letter of General Washington to Governor Cooke is to be found in "Sparks' Life," Vol. 3, page 47, and the address to the people of Bermuda in the same volume, page 77.

As it turned out, Captain Whipple had hardly set sail before the news came that one hundred barrels of powder had been received at Bermuda by a vessel supposed to be from Philadelphia, and another from South Carolina. The powder had been placed in a remote and secluded cave, and so secure did the authorities consider this place that only occasional visits of inspection were made to it. When Captain Whipple arrived off Bermuda he put in at the west end of the Islands, and the inhabitants were at first alarmed, thinking him to be in command of the King's armed vessel. But when he showed them his commission and instructions they welcomed him with much cordiality and friendship, and informed him that they had assisted in removing the powder. Soon after the inhabitants of Bermuda petitioned the Congress for relief, representing their distress in being deprived of supplies

that came from the northern colonies, and, according to the journal of that body, of Nov. 22, 1775, it was resolved that provisions might be sent them.

The powder sent from Bermuda led to the first great victory gained by Washington in the revolutionary war—the evacuation of Boston, and eventually to the sailing of the army under Gen. Howe to Halifax.

Nothing could exceed the indignation of the Governor when he received intelligence of the plundering of the magazine. Investigations were made, but in vain.

The year 1780 is memorable from the fact that a great hurricane raged then—in the month of October. It is still spoken of as "the great October gale." With the year 1782 began the administration of William Browne.

Governor Browne was a native of Massachusetts, and although an unbending Tory, was held in the highest esteem by his fellow-countrymen, as the following anecdote will show. It is an extract from the proceedings of the Essex Delegates after passing the Boston Port Bill. The 5th resolve, entered into at Ipswich, was "that a committee be raised to wait upon the Hon. Wm. Browne, Esq., of Salem, and acquaint him that with grief this country has viewed his exertions for carrying into execution Acts of Parliament calculated to ruin and enslave his native land; that while the country would continue the respect for several years paid him, it firmly resolved to detach from every further connection all such as shall persist in supporting or in any way countenancing the late arbitrary acts of Parliament, that the Delegates, in the name of the country, request him to secure them from the painful necessity of considering and treating him as an enemy to his country, and therefore that he would resign his office as Counsellor of the late establishment, and decline as a Judge, and in every other capacity, to execute the late Acts of Parliament and all others deemed by the Province as unconstitutional and oppressive."

His reply, sent in writing, proved the high character of the man:

Gentlemen: I cannot consent to defeat His Majesty's intentions and disappoint his expectations, by abandoning a post to which he has been graciously pleased to appoint me—an appointment made without my solicitation or privity, and accepted by me from a sense of duty to the King, with the hope of serving my country. I wish, therefore, to give him no cause to suspect my fidelity, and I assure you I will do nothing without a due regard to their true interests. As a judge, and in every other capacity, I intend to act with honour and integrity and to exert my best abilities, and be assured that neither persuasion can allure me nor shall menaces compel me, to do anything derogatory to the character of a Counsellor of His Majesty's Province of Massachusetts.

Wm. Browne.

It was with sincere regret that Mr. Browne's compatriots were compelled by the exigencies of war to confiscate his landed estates and to force him from his home and kin. He was a man deservedly beloved and respected, and carried with him into exile the affection of his friends. His appointment to Bermuda was made as a slight return for the great personal sacrifices and for the important services he had rendered on behalf of the crown. The high character of Browne had preceded him in the colony, and he was joyfully received on his arrival. By birth a colonist, he was better able to judge of the wants of the Islands and of the measures necessary to their welfare than persons whose lives had been spent in England.

His first speech to the Legislature was conciliatory, and the impression made by it was never disturbed. Under his wise rule enterprises of many sorts were entered into, and amongst them the whale-fishing (hitherto a monopoly), which was made free to all. The first newspaper in the colony was published in January 1784, and was called the Bermuda Gazette. The Bill providing for the removal of the seat of government from the town of St. George's to a more central situation was introduced in 1787, and was read for the first time. It is pleasing to observe how steadily the colony continued to flourish under the judicious management of Governor Browne. He found the finances of the Islands in an almost hopeless muddle, and left them flourishing.

Governor Browne left for England in October, 1788, and was succeeded by Henry Hamilton as Lieut.-Governor.

The principal commerce of the colony was, at this time, conducted by persons residing at a distance from St. George's, and it was a great inconvenience that the owners of vessels should be compelled to go so far to transact their business. Accordingly, strong efforts were made to induce His Majesty's government to permit the trade of the Islands to be collected in a more central situation. The township contemplated in 1784 was permitted to languish until the Legislature at this period selected the same spot as the place best calculated to suit all parties, and took measures to encourage the building of a town, to which they gave the name of "Hamilton," in compliment to the Governor. After much discussion the plan was accepted, and the town incorporated in June, 1793. Governor Hamilton was relieved October 30th, 1794, by James Crauford.

At this time every encouragement was offered to privateers, the people acted with their usual energy, and by their activity con-

tributed not a little to distressing the enemy in the vicinity of the Islands. Admiral Murray, of the Royal Navy, having recommended to His Majesty's Government the establishment of a dockyard at the Bermudas, the Legislature was summoned October 6, 1795, for the purpose of furthering so desirable an object by such grants or enactments as should be required. The place selected by Capt. Pindar, R.N., was the island now called Ireland Island, on which the establishment was afterwards placed. Several sloops of war were built in the colony in 1796, and the Legislature encouraged seamen to man them by offering bounties.

Governor Crauford was superseded; but not waiting for the arrival of his successor, he resigned October 22, 1796, and the administration devolved on Henry Tucker, President of the Council, who held office until February, 1798, when Governor Geo. Beckwith arrived and assumed the reins.

During Beckwith's term a vote of thanks was proposed and carried in the Assembly to Admiral Murray, not only for recommending the establishment of a naval depot but for the employment of the mechanics of the place in building several ships for His Majesty's service, of the wood of the colony.

Religious dissensions again disturbed the peace of the colony at this time, brought about largely by the incoming of a Methodist missionary, and by his efforts to teach and to preach to the slaves. A bill was passed by the Assembly to prevent persons pretending, or having pretended, to be ministers of the Gospel and not invested with orders according to the rites and ceremonies of the Church of England or that of Scotland from acting as preachers or schoolmasters under certain restrictions. The offending missionary was tried and convicted, fined £50, and sentenced to six months' imprisonment and to discharge all the costs of the Court. The act was disallowed at home, and at the ordinary June Assizes the Grand Jury presented it as a violation of the rights of the subject.

The poet Moore came to Bermuda in 1804 and acted as Registrar of the Court of Admiralty. His residence is pointed out with some pride, and the calabash tree under which he wrote many of his graceful poems is still standing.

The year 1812 is memorable for the beginning of the war between Great Britain and the United States. An American squadron lay ready in New York to strike the first blow immediately after a secret sitting of Congress, and two objects were proposed to the American Council—viz., to seize either the homeward-bound West Indian fleet or the Bermudas. It is said that the first project was

adopted by a casting vote only. Thus the colony had a narrow escape from capture, as it cannot be doubted that the attempt would have been a complete success.

Since the incorporation of the town of Hamilton the inhabitants of the upper and middle parishes had never ceased their efforts to obtain a removal of the seat of government from St. George's, and in 1814 the Home Government consented to the measure.

The removal of the seat of government accordingly took place, and the Assembly met at Hamilton for the first time, January 23, 1815. The clergy of the colony from the earliest times had been not only indifferently remunerated but frequently had great difficulty in collecting the small allowance made them by the Treasury. This had been made frequent matter of complaint by the Governors to the Legislature, and Gov. Cockburn, in opening the session of 1816, pressed the House to place them on a more favorable footing.

During the year 1828 the slave-crews of two vessels belonging to the Bermudas were, on their arrival in Ireland, informed by the authorities that they were free. This declaration was made formally and officially, and yet, notwithstanding this promise of freedom offered to sailors in a distant land, only three boys out of eleven left the ships. The incident speaks strongly in favor of the mild treatment the slaves of Bermuda received from their masters.

No sooner had the intelligence officially reached the colony that the Bill for the Abolition of Slavery had passed the Imperial Parliament (August 1, 1834) than the Legislature was called together, and, in Committee of the whole House, in consideration of the documents submitted to them, resolved "that slavery be abolished in the colony on the first day of August next, and that the apprenticeship system contemplated in said statute be dispensed with so far as regards the colony of Bermuda." This was adopted and passed into a law which was generally approved by the people. The decision, although attended with many cases of individual loss and hardship, was, viewed as a general measure, fortunate for the place, as all the vexations and evils of the apprenticeship system were at once avoided.

Every effort was made to induce the negroes to receive the boon of liberty with discretion. The Governor, Sir S. B. Chapman, issued his proclamation directing the first of August, then approaching, to be religiously observed. Divine service was held in all the churches of the colony; the clergy exerted themselves in public and in private to effect the desired end, and the day passed as decorously as could have been desired. Under the strong and wise

influence of the Rt. Rev. Aubrey C. Spencer, who, as Rector and Archdeacon, had deserved and held the respect and affection of the community, the coloured people had been trained and educated to receive the great blessing of freedom with such good feeling and decorum that few, if any, scenes of disorder occurred.

On the 12th September, 1839, another great hurricane burst on the Islands, causing great damage to property and shipping, although no lives were lost. The following winter was an unusually severe one, and during the night of December 24th, ice, ranging from one-eighth to a quarter of an inch in thickness, formed on the low, swampy lands, and considerable damage was done to vegetation. There appears to have been no record of frost prior to the event or since.

The currency of the colony had hitherto been reckoned at twelve shillings sterling to the pound; but this having been always a source of confusion in business transactions, an act was passed during the session of 1841 to assimilate the currency with that of the mother country. The act came into force after January 1st, 1842. The people of Bermuda suffered about this time through the unsoundness of American institutions, and especially by the failure of the United States Bank. They had also, in 1835, met a loss by the failure of the Fire Insurance Companies of New York—caused by the great fire in that city, which left them so crippled that they were unable to meet the extraordinary claims thus brought upon them.

The terrible earthquake of 1843 was felt, though slightly, in the Bermudas. In the early part of August a dreadful fever made its appearance in St. George's, and spread with great rapidity over the colony.

During all these years the commerce of the colony had been carried on by sailing craft, many of which were built in the islands from the native cedar. Occasional steamers had called for coal or orders, but the need of a permanent, regular steam service had long been felt, and when, in April, 1869, the *Fah-kee* arrived from the United States—the beginning of what was to grow into a permanent and efficient service—there was great rejoicing among the people. The products of the islands are vegetables, almost exclusively, and need careful handling and prompt delivery—conditions difficult to secure in sailing vessels. Several lines of steamers now connect the Islands with the outer world.

The affairs of the colony ran on smoothly for many years under a succession of Governors, who appear to have studied the needs

and best interests of the people. Gen. J. H. Lefroy, whose term, beginning in 1871, continued for some three years, is notable for his great care and vigilance in the exercise of all his duties, and for his compilation of the early annals of Bermuda—a book evidencing great care and study. His works on the flora and fauna and the geology of the group are valuable and trustworthy.

Previous to the Civil War in the United States, Bermuda had for many years only been known to the world as an important British naval station. Its isolation and small extent had kept it from being brought into contact with the outside world to any extent, although occasional cargoes of fresh vegetables were sent to New York, and some few invalids had come and found rest and healing in its balmy air. The Home Government expended vast sums from time to time—in fact, almost continuously—in roads and fortifications; troops were always stationed in the many fortifications, and great works were carried on at the naval station. The great dry dock—the largest in the world—was towed out from England and landed in position on the 28th May, 1869, after a passage of 29 days from the Downs. This dock is sufficiently powerful to lift a ship with a displacement of 10,000 tons—with the weight of the dock, a displacement of 18,000 tons. The larger vessels now being built require a dock still larger, and preparations are rapidly going forward with that purpose in view.

The old town of St. George's had become only a station for calling vessels. Little life was to be seen, except that among the troops quartered at its fortifications. Very occasionally a vessel would come in, then a little movement would be felt, and then repose and quiet would again rule. But the American Civil War awakened the old town into life and activity, for it had become the headquarters of the blockade runners. The wharves and harbour were crowded with steamers, great heaps of cotton and other products were everywhere on its piers and in its warehouses, and money was plentiful. Many fortunes were made at that time, which was one of unprecedented prosperity for the place. With the close of the War, the old town sank back to its normal condition once more, though of late years it has recovered something like commercial activity, for its position is very favourable for passing vessels to enter for coal, water, provisions, etc., and to receive orders from their owners, and this class of commerce is steadily increasing at the present date.

Nowhere in the world does the traveller find more polite and courteous treatment from the native inhabitants—black as well as

white—than in Bermuda. Even the children of the negroes are taught to read and write, the schools being numerous, good, and well attended, as are also the places of worship.

In the largest town, Hamilton, are many fine dwellings, boarding houses, and hotels, which, during the winter season, are filled with people who come to escape the rigours of the northern winter and to enjoy the beautiful climate. This tourist trade is of immense value to the colony.

The Bermudas—alias Somers Islands—are situated in Lat. $32^\circ 14' 5''$ North; Long. $64^\circ 40' 55''$ West; taken from Gibb's Hill Lighthouse at an altitude of 362 feet above sea-level.

Distances: From St. David's Light to	Charleston, S.C.,	766	naut. mil.
" " " "	" Cape Hatteras,	568	" "
" " " "	" Cape Henlopen,	639	" "
" " " "	" Sandy Hook,	666	" "

There are about 150 islands and as many more islets, all lying within a space of about 15 miles by 5 miles; the group being in the form of a fish-hook or shepherd's crook, and the longer islands being connected by causeways, bridges, and ferries.

They lie northeastward by southwestward, Ireland Island being at the northwestern end of the crook, St. George's at the other end.

The extreme length of the land is about 26 miles. It varies in width from three miles to three-quarters of a mile. It contains 10,019 acres of land, of which some 2,440 acres are now under cultivation. A larger area for cultivation could be secured by levelling slight elevations, filling swamp lands, and by drainage.

The whole group or archipelago is surrounded by a line of reefs of coral formations, thus making it impossible to enter any harbour at night, or even to find the channel by daylight, without employing a skilled pilot. It is strongly fortified, and, in fact, the group may be considered as a great natural fortress, while it is also the winter headquarters of the North Atlantic and West Indian Squadron, whose summer station is Halifax. It is, in fact, an important outpost of the British Empire.

The visitor, as he approaches the Islands, is struck by their picturesque beauty of outline—the mingling of land and water, as bays, inlets, and little islands, are revealed when the steamer skirts the shore and enters the main bay on her way to the inner harbour—and also by the marvellous colouring in sky and water, which is a never-failing source of delight, not diminished by familiarity.

The transparency of the water and the mildness of the climate

have been noted by many men eminent in the world of science. It has been suggested that a permanent school might be established in the colony for the study of marine growth, with an aquarium and also a botanical station for tropical plants, thus securing to the student immunity from the diseases peculiar to tropical countries, while giving all the advantages of tropical vegetation. Such schools might be established and sustained by the Universities of the English-speaking peoples, to the great advantage of science.

Hamilton is the principal town, and is incorporated as a city, with a population of about 2,000 people. It lies on the southern slope of the inner harbour, and is an attractive place, containing many fine residences and public buildings.

Here are situated the Government Buildings, the principal foreign Consulates, the great hotels and business houses, and it is the depot of all, or nearly all, foreign commerce. Vessels can lie at the wharves with 23 feet of water at low tide. Improvements in deepening the harbour and channels are being considered.

St. George's, the only other town and port, was formerly a commercial centre of importance. Its nearness to the outer sea and its fine harbour make this port convenient for vessels calling for orders, provisions, or coal. A plan for increasing the depth of and widening and straightening the channel has now been submitted for action.

These two ports are the only ones for commercial use. The Government Station at Ireland Island is used exclusively for naval purposes.

The climate of Bermuda is, in the main, soft and gentle. The thermometrical tables furnished by General Russell Hastings, an American resident, extending over a period of 21 years, give but little variation, ranging from 50° in the early morning to 70° at midday during the winter seasons and 85° to 87° in the heat of summer as the maximum temperature. There is neither frost nor malaria. The proximity of the Gulf Stream, running to the westward of the group towards the north and east, serves as a shield, reducing the rigours of the winds that sweep over the ocean from the continent. The condensation of these vapour-laden clouds gives frequent rains, most essential to the land, the porous nature of the same absorbing them so quickly that after even very heavy rainstorms there is scarcely a trace of mud left.

The rain-water is preserved in huge stone tanks or cisterns for household use. There being no springs nor brooks, the wells, containing brackish water, are unfit for use, except for flushing purposes.

The effects of the climate upon the agricultural produce are more favourable than in other countries under the same mean annual temperature. Besides many of the fruits of the temperate regions, the heat of summer permits those of a tropical character to flourish, hence a greater variety may be produced here than in any other part of the world. The season for vegetation is sufficiently extended to ripen a great many kinds of grain, vegetables, and fruit.

The most agreeable season at Bermuda is in the winter or cold season, from November to April or May, the mean temperature being about 60°. Spring begins ~~in February~~, the weather continuing mild, with refreshing showers and gentle breezes from the south and west, until the end of May. The summer begins in June, but the heats are rarely oppressive until the end of the month, when it becomes sultry. The thermometer rises no more than 87°—rarely higher—but the humidity of the air renders the climate oppressive. In mid-September the weather again becomes pleasant and the atmosphere cooler.

From all this it will be seen that the climate of Bermuda is most healthful to all invalids, excepting those who are suffering from extreme pulmonary troubles.

The buildings, private and public, are made of the native stone—white limestone. This is easily quarried, being cut out by hand-saws, but it hardens on exposure. The roofs are covered by thin slates of the same stone, and are then given a covering of cement, after which they are whitewashed, and are quite impervious to water. They are cool, comfortable, and dry, and are of pleasing but simple design, with wide verandas. The general effect is very fine—Spanish or Italian in style, rather than English. The population of the colony is now about 16,113, to which must be added the military strength of some 2,500 men, and the naval contingent.

There is also the army of tourists, who visit Bermuda at all times during the year, but especially from November to May.

The industries are largely agricultural, including an establishment for the manufacture of the home-grown arrowroot, which is said to be the finest in the world. In other agricultural products, also, it stands unrivalled; from 2,440 acres under cultivation the consular records show that the average production was 450,000 dollars annually, sent to the United States. Nor does this include the amount exported to other countries or the amount used in the colony.

With a better system of cultivation, rotation of crops, larger

holdings, more capital invested, and the scientific skill employed that is essential to crop raising as to manufacturing, these figures would show greater and better results. Much idle land—hill-slopes and marshes—that might be filled, would bring up the area that could be profitably cultivated to perhaps more than double the present number of acres; and this is of importance to the people of the United States, for Bermuda furnishes them with fresh vegetables, onions, and potatoes at a time when none are grown there; moreover, these vegetables are of the very best in quality, and come at the most desirable season.

The growing of lily-bulbs—*Lilium longiflorum Harrisii*—to supply the great demand at Easter for floral decorations of churches and houses, is another important industry, needing greater skill and care in its development. These bulbs, in a dormant state, are shipped to America by steamers and sold to the hot-house trade, who plant them under glass, and at the proper time force them, that the flower may be ready at the needed time to meet the great demand at Easter. These flowers, commonly called Easter lilies, seem to be the only lily that can be fully developed at a time when in most demand, and the curtailment of the supply would be matter of great regret to the people of the United States.

NOTES ON THE BERMUDAS.

BY

CHARLES L. BRISTOL.

The Bermudas are a small group of low-lying islands lying alone in the Atlantic Ocean, about seven hundred miles due east from Savannah, Ga., and nearly the same distance south from Halifax, N. S., or in latitude 31° N., longitude 65° W. The present land area comprises five large islands and many small islets. To the north and east of the land is an area of reefs, which, taken with the land, forms an ellipse whose major axis, which runs N. E. and S. W., is about twenty-five miles in length and whose minor axis is about twelve miles.

The whole ellipse, or Greater Bermuda, as Prof. A. E. Verrill, of Yale University, has recently called it, covers about three hundred square miles, and of this the land takes up about twenty square miles, three-fourths of which lies in the main island. The land area is

confined to the southwesterly side of the ellipse, forming a long, narrow strip about thirteen miles long in a straight line, or about twenty miles long following the curve of the ellipse. This strip is seldom two miles wide, and for much of its length is less than a mile wide. On the map it resembles a huge fish-hook, with the shank on the N. E. and the point of the hook on the S. W. There are no harbours available for modern ships on the outer shores of the islands, and there is but one break in the chain of reefs that will admit vessels of any size. This channel, St. George's, at the easterly end of the islands and close to the land, has recently been dredged to admit the largest battleships of the British navy—for Bermuda is one of the three great naval stations of Great Britain along the North American coast.

The principal town and only city is Hamilton, situated near the central part of the group. The approach to this harbour is through the St. George's Channel and along the north shore to the Great Sound lying in the curve of the fish-hook. Thence the vessel proceeds through a narrow channel to her dock. At one point the channel is so narrow that one can easily toss a biscuit to either shore. The city contains about two thousand inhabitants and more than five hundred buildings. It is the seat of the Government and the centre of trade and commerce.

The old capital, St. George's, lies at the extreme northeasterly end of the islands, and dates from the earliest settlements in 1609, and has a population of about one thousand. It is a quaint old place, built as the Spanish towns of the West Indies were built in those days of buccaneers and other hardy men of venture. The streets are narrow and bordered by high walls that make every man's house his castle, but shut off all view save from the second-floor windows.

It has a modest botanical garden that is a gem in its way and worthy of a visit from every tourist. In it, just to the left of the entrance, is a memorial to Sir George Somers, after whom the town is named. At present the business interests of St. George's are dormant. The beautiful and spacious harbour, with ample depth for large steamers, is cut off from the channel by a shallow entrance; but if this obstruction were removed, the old town would probably again waken into its old-time vigour.

The population outside of these two corporations is distributed throughout the islands, which are divided into nine parishes, named: Sandys, Southampton, Warwick, Paget, Pembroke, Devonshire, Smith's, Hamilton, St. George's. The total population is about sixteen thousand, of which about six thousand are whites and ten thousand are coloured. Besides these there are about three thousand one hundred soldiers, sailors, and labourers in the barracks and dockyard.

The whites are nearly all of English descent, a large number of the families carrying their ancestry back to the first or very early comers. The coloured population are descendants of the North American Indians (Pequods largely), who were first used on the plantations as slaves, and of African negroes, who were imported later. They are, as a rule, well built and vigorous, as that word goes in the warm, moist climates.

The industries are entirely agricultural or those pertaining to the catering to the troops and the American tourists who visit Bermuda in large numbers during the winter, though the charm of early summer, when Bermuda is handsomest, is now attracting others. The principal crops are early onions and potatoes for the New York market, lily bulbs, and arrowroot for starch.

The government is almost if not the very last survivor of the form common to the early colonies in America, such as that of Virginia and Massachusetts. It is vested in a Governor and two councils, appointed by the Crown, and a House of Assembly chosen by qualified electors for seven years.

The religion of the great majority of the islanders is that of the Church of England or that of the Wesleyan Methodists. There are a few Roman Catholics, and about as many Presbyterians, who claim allegiance to the Free Church of Scotland.

Public education is very inefficient, judged by the standards in the United States, and is confined to lower grades of instruction. There are a few private schools that prepare for college, and do their work well; but the young Bermudian who can do so goes to Canada or to England to complete his education, or failing this, comes to the United States.

The Bermudas had their origin long, long ago, during some vast convulsion of the ocean-floor, when a stream of molten rock spouted upward through a rift, and cooling rapidly as it rose, formed a steep volcanic cone over 15,000 feet in height that rose nearly to the surface. This was covered in the course of geologic time by the shells of the tiny protozoans that fall like a gentle but constant snowstorm from the surface of the ocean as their builders die, and that form a firm foundation for the future island. At last, when the top came near enough to the surface, the floating embryos of corals, mollusks, lime-secreting worms, and plants lodged on it and began a much more rapid deposit of lime-rock material. When the growing masses rose high enough to come within the grasp of the waves, some of them were broken and ground up until at last dry sand beaches lifted their heads above the water, only to be seized upon by the winds and transported over the area until, aided, perhaps, by some elevation of the sea bottom, the whole mass appeared above the wave.

This process of transporting the beach sands by the winds into dunes is going on to-day, and may be seen at the so-called "sand glacier" in Paget parish. The sand in this "glacier" has been moving northeasterly from the beach for the last forty years or more, until it has engulfed a house in its course and obliterated several fields. Of late its course has been retarded and almost arrested by the growth of oleanders, the beach convolvulus (*Ipomea pes capræ*), and a few other plants. As a result the surface is gradually consolidating owing to the action of the carbon dioxide in the rain-water, and becoming rock. Successive showers, charged to some extent with carbonic acid, dissolve a minute portion of the lime, and, percolating through the mass, re-deposit these portions as a cement to bind other grains together. All kinds of curious stratification are to be found in the rocks over the island, evidently resulting from variations in the direction and force of the wind.

This has been called *Æolian formation* by Nelson in his account of the geology of the Bermudas in 1840; and by Dana, in 1875, *Drift sand-rock.*

Extensive caverns exist all over the islands whose floors are now covered by sea-water. These have been produced by the solvent action of the rain-water on the less firmly cemented underlying sands that have been thus washed out into the sea. In ancient geologic time cavern-making must have proceeded on a vast scale, for now the topography of the surface is extensively modified by the "sinks," as the natives call them, which are the depressions left by the falling in of the roofs of caverns grown too large to support the overlying mass.

There is plenty of evidence that the whole of the ellipse, or Greater Bermuda, was for a long time above water. Cedar stumps are often found by divers out on the reefs, and the shells of land snails (*Helices*) have been found in rock now 45 feet under water. One of these snails resembles closely the living form, and another differs mainly in size. Although this evidence points to a comparatively recent subsidence, little, if any, change has taken place during the last 300 years.

Evidence of this is adduced by Prof. Verrill in a recent paper* from the reverse of the ancient seal of the Bermuda Company, engraved on the border of Norwood's map of Bermuda, published in 1626, showing the wreck of a French vessel in 1593 alongside of North Rock. This sketch of the rocks was probably made by Norwood while engaged on his survey in 1617, and shows the rocks very much as they are now. The photograph accompanying this text shows these rocks as they appear to-day, and was taken by a member of the New York University Biological Expedition in 1898. They are the sole remainder of the great land area of Greater Bermuda, and are now nine miles distant from the nearest land. They are 16 to 20 feet high, and stand on a flat platform, just bare at dead-low water. Near the base each rock is worn so as to show a neck, and as time goes on, and this neck becomes smaller, they must be toppled over during some violent storm.

The reefs of Bermuda are commonly, and quite appropriately, called sea-gardens by the Bermudians. They are easily visited, and the coloured fishermen, who spend almost all their lives upon them, know them as well, if not better, than the landsmen know the land. Their boats are equipped with water-glasses, through which one sees to the bottom through thirty feet of water as through a window.

* Notes on the Geology of the Bermudas, Am. Jour. of Sci., Vol. IX, May, 1900.

The coral masses are of various colors—some yellow, some chocolate brown, others almost white. Great sea-rods and sea-fans (*Gorgonias*) wave lazily in the tide, and stand out in boldly contrasting colours of purple or brown from among the masses of green and olive sea-weeds. Here and there are clusters of sponges—some bright scarlet, some vivid green, others dull and inconspicuous. Sea-urchins, deep black, with long spines (*Diadema*), or purple and partly covered with dead shells, sea-weed or other flotsam (*Toxopneustes*), stand out like knobs on the rocks. Great sea-puddings, as a holothurian (*Stichopus*) is called, crowd together at the bottom, while in the crannies and on the sides of the rock is a great host of calcareous weeds, mollusks, lime-secreting, tube-building worms, ascidians, hydroids, and beautiful sea-anemones. To the zoölogist these reefs are of intense interest, for here, only a short run from New York by the Quebec Steamship Company's steamers, in a location absolutely free from fevers, and with a climate mild and delightful, he may study tropical marine fauna with ease and pleasure.

NOTES ON CLIMATOLOGY.

BY

ROBERT DE C. WARD.

CLIMATE OF MAMMOTH TANK, CALIFORNIA.—One of the most interesting places in the United States from the point of view of climate is Mammoth Tank, Cal., situated on the line of the Southern Pacific Railroad in the eastern portion of San Diego Co., and in the southern portion of the Colorado Desert. This station has gained a certain amount of distinction because of the statement in Greely's *American Weather*, page 138, that Mammoth Tank, Cal., and Camp Mohave, Ariz., "doubtless have the smallest-known rainfall on the face of the globe." While this is a somewhat misleading statement, yet, nevertheless, Mammoth Tank does possess a peculiar interest because of its very small annual rainfall. In the February number of *Climate and Crops: California Section*, there is an account of the Climatology of Mammoth Tank. From this account it appears that the mean annual temperature, based on records of 23 years, is 76.0°. July is the warmest month, with a mean temperature of 98.5°; and January is the coldest, with a mean of 53.9°. The highest temperature was recorded on August, 17, 1878, and was 130°, and the lowest was 22°, in December, 1895, giving an absolute range of 108°. Temperatures of 100° and over have been recorded in every month except January, February, November and December, and temperatures of 90° and above in every month of the year. Temperatures of 120° and over have occurred in the five months of May, June, July, August and September. The mean annual rainfall for 23 years is 1.81 inches. The greatest amount in any one year fell in 1889, and measured 5.48 inches; while in 1897 and 1898 there was only a trace during the whole year. The greatest monthly rainfall was 3.18 inches in December, 1889. In June the rainfall record for each one of 22 years is marked "o." Only once during the whole period of 23 years was there as much as a *trace* of rainfall during this month.

THE OLD YUMA TRAIL.—A graphic description of the climatic conditions of this same arid portion of our country is given by McGee in a paper on "The Old Yuma Trail," in the *National Geographic Magazine* for March and April last. The pathetic history

of the loss of life along the Trail in the days of the gold fever is written in the numerous graves, which are noted on the route. And yet

> The roll will never be written in full, since most of the unfortunates left no records, scores leaving no sign save bleaching bones; but observers estimated that there were 400 victims of thirst between Altar and Yuma within eight years.

The desert vegetation, the sinks and playas, and a desert storm all come in for a share of the description. The storm, which gave twenty minutes of continuous downpour, yielded a precipitation which was estimated at 1½ to 1⅓ inches, and yet

> Over the waste of drifted sand not a rill was formed, not a puddle was produced, not even a watery surface was seen save in a few "slick spots" (*i. e.*, the alkaline silt patches) of the cowboys—the sand simply swallowed the flood like a sponge, and was visibly moist only to depths of 3 to 4½ inches.

Of peculiar interest are Las Tinajas Altas, a series of pot-holes or cataract pools worn in the bottom of a gulch by the torrents which are produced by the rare storms of that region, and containing water. These high tanks lie on the leeward side of a rugged range of hills, which is the first to intercept the moist current from the Gulf of California. This whole region, unattractive as it may seem at first sight to most persons, has been the scene of a most wonderful struggle and development of animal and plant life, as has been so well described by McGee himself in previous papers. The "unparalleled solidarity" of the life in the desert, as McGee has termed it, was developed because of the common struggle of all forms of life against the hard climatic conditions surrounding them, these conditions forcing animals and plants

> into a harmonious interrelation in which none could dominate without risk of starvation, none yield unduly without certainty of extinction.

Climate of Manila.—A recent publication of the Jesuit Observatory of Manila contains a summary of observations of pressure, temperature, and humidity taken hourly during 1883–1898, and of rainfall taken during 1865–1898. From these tables it appears that the normal monthly and annual temperature, relative humidity, and rainfall are as follows:

	Temperature. (Degrees Fahr.)	Relative Humidity. (Percents.)	Rainfall. (Inches.)
January	77.0	77.7	1.193
February	77.7	74.1	0.413
March	80.4	71.7	0.736
April	82.9	70.9	1.142
May	83.3	76.9	4.197

	TEMPERATURE. (Degrees Fahr.)	RELATIVE HUMIDITY. (Percents.)	RAINFALL. (Inches.)
June	82.0	81.5	9.622
July	80.8	84.9	14.567
August	80.8	84.4	13.866
September	80.4	85.6	14.925
October	80.4	82.6	7.536
November	79.0	81.6	5.126
December	77.4	80.7	2.134
Year	80.2	79.4	75.457

CLIMATIC DIFFICULTIES IN THE WAY OF THE PROPOSED RAILROAD TO INDIA.—Sir T. H. Holdich, in a recent article on "Railway Connection with India" (*Scottish Geographical Mag.*, May, 1901), points out very clearly some of the engineering and other difficulties which are to be met with along the various proposed routes for a railway to India. Among these difficulties that connected with the climate is given considerable prominence. Thus the region of the Hindu Kush presents vast, if not impossible, engineering problems to be solved, if ever a railroad is put through that region; and, furthermore, the violent storms of wind and snow, the avalanches of stones and mud, and the intense cold of the winter are stated to be beyond the possibility of successful conquest by any conceivable future principle of railway development. Again, the route along the coast from Persia would take the railroad through climatic conditions which for four or five months of the year are regarded as "insufferable," and this climatic objection the writer believes to be almost enough to be prohibitive, so far as this proposed line is concerned.

HINTS TO TRAVELLERS REGARDING METEOROLOGICAL OBSERVATIONS.—An article designed to supply travellers with the necessary instructions in the use of the ordinary meteorological instruments which they may carry with them is contributed by Dr. H. R. Mill to *Hints to Travellers, Scientific and General, edited for the Council of the Royal Geographical Society by John Coles* (8th edition, London, 1901). Dr. Mill has also gone a step further. Many travellers carry no instruments, but wish to make observations of some sort on the climatic conditions of the countries through which they are passing. The needs of this class of persons are met by Dr. Mill in a series of instructions designed to show how evidences of the climates through which the traveller's journey takes him may be

obtained by noticing the effects produced by the climatic conditions upon the land, vegetation, human occupations, and the like. If all travellers were to follow some systematic and intelligent scheme of observations regarding meteorological phenomena we should have fewer vague and unreliable descriptions of the sort which now encumbers books and articles dealing with travel.

THE EFFECT OF THE WEATHER IN GERMANY ON THE AMOUNT OF NITRATE EXPORTED FROM CHILE.—The report of the director of the "Asociación Salitrera de Propaganda" for the year 1900 brings out a striking illustration of the effect of weather conditions in a distant country upon the amount of nitrate exported from Chile in that year (Bulletin Bureau of American Republics, April, 1901, 672). The decrease in the consumption of nitrate in Germany in 1900 amounted to 1,273,050 quintals. The reasons for this falling off are stated to have been connected with the weather conditions. In 1899 the weather in Germany was favourable to the growth of straw, and this resulted in the production of an unusual quantity of farmyard manure, which naturally entered into competition with the nitrate. Furthermore, late spring frosts in Germany also retarded the use of nitrates, and a long drought in the eastern part of the country prevented their use on the grass lands.

MAP NOTICE.

BY

HENRY GANNETT.

The General Land Office has recently issued an edition of its map of the United States for 1900. In general appearance it differs little from former editions, but the scale has been changed slightly; and as the scale is not given, the reader will find it necessary to determine it from the projection lines. Besides the ordinary recent information assembled upon the map, it presents, by bold lines and lettering, the accessions of territory and the route of the Lewis and Clark expedition. These seem scarcely in keeping with the character of the map, which is certainly not historical.

At the foot of the map are added, upon various scales, small maps or diagrams of our recent accessions of territory. Among them appears "Pine Island," evidently intended for Isle of Pines. The addition of this island in this position in an official map, as a possession of the United States, is a bit of unwisdom, as the implication carried with it cannot fail to irritate our Cuban neighbours.

PHYSIOGRAPHIC NOTES.

BY

RALPH S. TARR.

Paleozoic Appalachia.—The Maryland Geological Survey has more nearly solved the problem of the proper field for a State survey than has been done in any other State. Too much credit cannot be given to Prof. Clark for the breadth of view which has characterised his administration of the affairs of the Survey. The reports are written by high-grade specialists; they are well edited and beautifully printed; and they cover not only the standard subjects of stratigraphic and economic geology, but also the physiographic aspect, which most surveys still ignore. Moreover, they are papers of great educational value, because they deal with subjects of general interest written in clear, untechnical language, and therefore capable of being read by intelligent laymen and used by geography teachers. Of the latter class of papers Willis's Paleozoic Appalachia (*Maryland Geological Survey*, *Special Publication*, Vol. IV, Part I), is an excellent example.

Willis's paper is prefaced by a statement of some fundamental geological processes under the headings: Illustrations of Erosion; Illustrations of Sedimentation; Illustrations of Deformation; and Relations of the Three Processes. This is followed by a statement of the Paleozoic history of Maryland and the adjacent States, applying the principles of geology to an interpretation of the development of the region. The long, complex, and interesting geological history has already been made familiar to geologists by the work of various observers, but it has never been so clearly and delightfully presented as in this paper, which starts with the Paleozoic era, when

> the region comprised a sea and a land. The sea lay west of the land; the land stretched eastward beyond the present extent of the continent. The shore along which the western sea met the land migrated during ages far eastward and again far westward, with many minor oscillations back and forth, and the areas of land and sea shrank and expanded, each in opposition to the other. The land may be called the continent of *Appalachia;* the sea was the mediterranean of North America.

From this time Willis traces the development step by step, showing the complex history of sedimentation, vulcanism, deformation by mountain-folding forces, and denudation down to the present time. One who reads this paper cannot fail to gain a clear view of

the origin and development of the present Appalachian structure. Nor can he but be impressed with the intimate dependence of man upon physiography and of physiography upon geology—a point well stated by Willis in the closing paragraph, as follows:

> The detail of mountain and valley sculptured on the upraised mass is determined by the arrangement of the strata laid down in the vanished Paleozoic sea. The geography, the atmosphere, and the life of that distant time determined initially the plan of the present landscape. They conditioned human existence. Broad farmlands or craggy crests, fertility or sterility, mineral leanness or wealth, the courses of highways and the sites of cities—all the conditions of man's physical environment, are related in the Appalachians to the long Past, even to the remote Past of the era of ancient life.

THE CANADIAN ROCKIES.—Few American geologists have had a more favourable opportunity for the study of broad physiographic features in a large section of almost unknown country than the late Dr. George M. Dawson. Many of his observations and generalisations have been published in various reports, but recently there has appeared a broad summary of the physical history of the Canadian Rockies as his Presidential address before the Geological Society of America (*Bull. Geol. Soc. Amer.*, Vol. 12, 1901, pp. 57–92), unfortunately one of his last utterances upon geology.

On either side—that is, both east and west—of an Archean axis extensive deposits of sediment were accumulated, reaching in the western geosyncline a total depth of over 89,000 feet, in the eastern or Laramide geosyncline over 46,000 feet. All ages, from the Cambrian to the Pliocene, are represented in this great thickness of strata, though it is not probable that the strata were ever actually superimposed at one place or time in the western geosyncline, though no doubt they did attain the full thickness in the eastern geosyncline. During various ages there was extensive extrusion and intrusion of volcanic materials, so that with the sediments there is much igneous rock. Again and again folding occurred parallel to the border of the Pacific basin, causing great changes in the relative level of the land and sea. The force of compression acted from the Pacific side, the greatest recent uplift, and the one from which the present structure has been largely derived, occurring in the period of early Tertiary, as elsewhere in the Rocky Mountains.

This great mass of disturbed rock, with its complex history, has naturally been subjected to tremendous denudation, in part due to its position

> on the eastern border of a great ocean, where, in northern latitudes, an excessive rainfall must have occurred at all periods on the seaward mountain ranges. No com-

parable denuding forces were probably ever operative on the east side of the continent in similar latitudes since the definition of the ocean basins of the Pacific and Atlantic.

Profound subsidence has admitted the sea into the deeply-carved valleys, forming the wonderful fjords along the western coast of Canada.

THE PHYSIOGRAPHY OF ACADIA.—Dr. Daly's paper (*Bulletin of the Museum of Comparative Zoology*, Vol. XXXVIII [Geological Series, Vol. V, No. 3], pp. 73–104, 1901) is a welcome contribution, for it is the first attempt to interpret the physiography of Nova Scotia upon the basis of the modern conception of the subject. It has long been known that the general physiographic development of the Nova Scotia peninsula has resembled that of New England, or, as Daly says, that

as regards axial trends, formational composition, and structure, the uplands and lowlands from Georgia to Gaspé belong to one system.

Mountain-folding of Paleozoic date has introduced very complex geological structure, as in the eastern United States; and the subsidence of the Bay of Fundy region has permitted the accumulation of thick beds of sediment, among which, as in the region to the south, are included the Triassic rocks. These broad points in the geological history of the region are well known; but Daly carries the study further into details, and, as would be expected from one of the Harvard School, especially along the lines of subaërial denudation.

The main object of Dr. Daly's paper is to bring forward evidence that the Acadian land-forms have been twice reduced to the peneplain condition,

each (peneplain) a nearly perfect plain of denudation, interrupted by incised valleys and surmounted by residual hills.

These plains are believed by Dr. Daly to be due to denudation that was essentially subaërial. He discusses the alternative hypothesis of bevelling, but does not find that it applies to this region; nor does marine denudation seem to be competent to explain the facts. The Nova Scotia region, therefore, resembles the New England region in physiographic history, as might be expected. This correspondence in history in the two regions is clearly brought forward in a table of parallel columns—one for Acadia, the other for New England—and the resemblance between the two is striking.

Even one who does not thoroughly agree with Dr. Daly in his interpretation of the facts cannot fail to be impressed with the

great value of the paper as a statement of important fact and a masterful discussion of the subject. It stands as one of the best contributions to the literature of peneplains, now quite extensive; and, like several papers by Prof. Davis, it is distinguished from many others in the fact that it considers the question whether it may not be possible to adopt some other explanation. Whatever may be the fate of the peneplain explanation, it is certain that many so-called peneplains will not stand the test of real investigation; and that if the explanation is established, for a particular region, it will not be upon the basis of affirmation—a means which not a few American geologists are still employing. Rather it will be by such careful discussions as Dr. Daly's paper, the several papers by Profs. Davis, Hayes, and Campbell, and a very few others.

The Preglacial Drainage of Ohio.—The interference with the pre-existing drainage by the glacier and its deposits has led to many perplexing problems upon which physiographers have been long at work. The problem is especially perplexing from the fact that critical sections are often completely obscured by drift; but in those States, such as Ohio, where many borings have been made for oil and gas, the problem offers opportunity for solution. The paper before us (*Ohio State Academy of Science*, *Special Papers*: No. 3, Dec., 1900) contains contributions from four investigators—Messrs. Tight, Bownocker, Todd, and Fowke—whose studies were made possible by the research fund established by the wise generosity of Mr. Emerson McMillin. Each paper deals with a specific region, and is illustrated by a map showing the interpretation which its author places upon the drainage peculiarities of his district. Much of the discussion is of purely local interest, the point of general interest being the very large number of changes in stream-courses resulting from glacial deposits in pre-existing valleys. As a result of these changes the drainage of the State has become different from that of preglacial times, not merely in detail, but in many fundamentally important respects. The most important of these diversions is that previously described by Chamberlain and Leverett, by which the entire upper Ohio, above New Martinsville, was withdrawn from the Erie drainage and added to the Ohio. Could the preglacial drainage of the State be restored there would need to be numerous changes in the industries of the region. For example, numerous towns now located on good-sized streams would find themselves either on divides or else on small tribu-

taries, and cities now connected with the sea by the Ohio and Mississippi would be on small streams tributary to the St. Lawrence system.

OLD CHANNELS OF THE MISSISSIPPI IN SOUTHEASTERN IOWA.— In a recent paper under the above title Leverett (*Annals of Iowa*, April, 1901, Vol. V, pp. 38–51) says:

> One would think that a stream which has been dignified by the title "Father of Waters" would be one that had shown evidence of exceptional stability rather than a bent toward vagrancy. But the Mississippi has been truly a vagrant stream; sometimes it has been forced from its bed by the intrusion of ice in the glacial winter, and sometimes by the accumulations of its own dirt or sediment. It has been shifting not only in the middle portion on the borders of Iowa, but in its lower and upper portions as well. So many have been its wanderings that only a part of them are as yet understood.

After briefly describing the various advances and retreats of the ice, Leverett takes up the question of the old drainage, which is so obscured by deep drift deposits that it is difficult to interpret. Then follows a consideration of the effects of the various advances of the ice upon the Mississippi drainage, closing with a statement of the changes which have occurred since the Iowan stage of advance. During this stage the loess was deposited, apparently in some vital way connected with the great streams of the region. The loess filled the valley on the border of Iowa so that the stream flowed near the level of the top of the present bluffs fully a hundred feet above its present level. An elevation followed, and the streams began to deepen their channels; but they flowed in branching courses, as rivers do on a flood-plain, and at first the water began to cut various channels, one by one abandoned as the more direct valleys, or those which did not encounter rock, gained greater depth. The abandoned channels are still plainly seen.

While the course of the river is in large part in the old valley, in some cases it extends across rock walls, and there rapids are found. There seems little reason to expect further changes in the course; in fact, Leverett rather facetiously concludes his discussion by the following sentence:

> Indeed, in this upper part of the valley the "Father of Waters" seems to have settled down to a steady course, except at flood seasons, when it becomes too full to stay within bounds.

CERTAIN PERSISTENT ERRORS IN GEOGRAPHY.

BY

HENRY GANNETT.

In many of the text-books on geography used in the schools to-day old legends which were taught as truths a generation or more ago still survive, in spite of the fact that they have been discredited by geographers for many years. In consequence, these incorrect ideas are still accepted by the great mass of the people, and it is probable that another generation will pass before the truth will filter down from geographers into the text-books and from the text-books to the people.

An example of the persistence of error is the idea that the presence or absence of forests has an influence upon the amount of rainfall. Some keen observer long ago detected the fact that forested regions enjoyed a heavier rainfall than those not forested, and jumped to the conclusion that rainfall was produced by forests, and, as a corollary, that the removal of forests diminished the rainfall. Looking over the earth he found many treeless, desert, and semi-desert regions, and forthwith instanced them as frightful examples of the result of man's wastefulness in destroying the forests. Prominent among these examples are the shores of the Mediterranean, including the Iberian Peninsula, Italy, northern Africa, and Syria, which are often quoted as favourite illustrations of man's destruction of climate by his destruction of the forests.

In reply to this charge man can certainly plead not guilty. If his accusers had possessed a little more knowledge of the causes of climate and the conditions which modify it they would have seen at once that the geography of this Mediterranean region, the present configuration of the land and water, and the prevailing winds are such as to give it a light rainfall, forests or no forests. Furthermore, a knowledge of physiography would have taught them, in corroboration of the above, that the arid or semi-arid conditions now existing must have existed for many thousands, if not millions, of years, for the mountains, cliffs, and cañons are such as are carved only in arid regions, are not those of a moist climate, and these forms have not been made in a day. The situation is simply that the cart has been placed before the horse. Want of rain prevents the growth of trees; want of trees does not prevent rain.

This position is generally accepted among physical geographers, but the majority of the people still reverse cause and effect.

A persistent, widespread, and well-rooted error is the belief that floods in our rivers are greater and more frequent than formerly, and that this is due to the removal of forests from their drainage areas. Every great flood induces another flood of editorial paragraphs in the newspapers to the effect that man, by clearing away forests, has increased the flood-height of streams, and correspondingly diminished the low-water flow.

It is probable, although it has not been proved, that the clearing of land, by cutting away the forests and undergrowth, does change the regimen of streams, increasing their flood-height and diminishing the flow at low stages. In other words, water probably runs off or evaporates more rapidly from bare ground than from ground which is covered with trees or other forms of vegetation. But where the forests are cut away the land is seldom left bare; it is cultivated or quickly becomes covered with bushes, which hold the water quite as effectively as forests.

The main fact, however, is that the floods in our rivers are no greater or more frequent now than in the past. The Ohio river, for instance, has been gauged continuously for many years, and these gaugings show no appreciable change in regimen, whatever changes may have been made in the forest cover of its basin.

In the school geographies we are taught that the fiords of the coast of Norway, those deep gorges, partly filled by the sea, are proof that the coast has been sinking. How could such cañons be cut, it is asked, unless at the time of their construction they were above sea-level? But to-day, on the coast of Alaska, we see just such cañons in course of construction below sea-level. On this coast are scores of glaciers travelling in gorges which, near their lower ends, are many hundred feet below the level of the sea. The Muir Glacier, where its front meets the sea, is over 800 feet thick, 600 feet of which is below the level of the water, and this, like all other glaciers, is constantly carving its bed deeper. The Norwegian fiords were cut by glaciers, and, probably, while the sea and land were at the same relative levels. The coast of Norway may be sinking, but its fiords are not evidence of it.

Other familiar errors concern climate still more directly. The well-known mild climate of the northwest coast of America is commonly attributed to the balmy influences brought to it by the Japan Current; the Gulf Stream is supposed to have the same influence upon the west coast of Europe; and the cold climate of the east

coast of the United States is attributed to a supposed current from the Arctic Ocean hugging this coast.

That these explanations do not explain will be realized after reflection. Can it be supposed that the Japan Current, however warm it may be when it leaves the tropics, retains any appreciable amount of heat after a journey of 6,000 miles in northern latitudes? As a matter of fact, no trace of this current reaches the shores of North America, its force being entirely lost thousands of miles to the westward. There is nothing left but the merest drift of the surface water before the prevalent west wind.

In the North Atlantic the condition is much the same. The Gulf Stream loses its velocity and disappears as a current long before the British Isles are reached. That the cold climate of the eastern coast of the United States is caused by an Arctic current close inshore is disproved by the fact that there is no such current along this coast.

There is probably no phenomenon connected with the physical life of the earth which has been the subject of greater misconceptions than the currents of the sea. The maps of the school books are covered with lines and arrows, indicating currents in every conceivable direction, every temporary drift of surface water reported by navigators having apparently been recorded as a current.

The system of oceanic currents is very simple: a drift of water towards the Equator, a current along it, flowing westward to the land, there dividing, flowing north and south and dispersing.

This equatorial current has been attributed in the text-books to a variety of causes. The unequal heating of sea-water in different latitudes is a favourite explanation. This, however, could produce currents only by changing the volume of the heated water, and, unfortunately, if the water under the Equator were appreciably expanded by heat, it would cause currents in the opposite direction from those which exist. We should find them flowing away from the Equator instead of toward it.

Another explanation given is the increased evaporation in the tropics, thus lowering the surface of the water and causing an inflow from north and south. Were this of any appreciable magnitude it would undoubtedly cause a drift of water to equatorial regions, but there would be no corresponding outflow, such as the Gulf Stream and Japan Current.

A third cause assigned is the diminution of atmospheric pressure on the sea in the tropics, produced by the heating of the atmosphere and its consequent rarefaction. This amounts to a fraction of an

inch in the barometric column, and is, therefore, a small matter. Undoubtedly, if it had an appreciable effect upon the sea, this effect would take the form of a slight flow of water toward the Equator; but, when equilibrium was thus established, there would be no further flow toward the Equator, nor would there be any flow at all away from it.

Still another cause assigned is the increase in density of the water under the Equator, due to excessive evaporation, thus increasing the saltness of the water. It is difficult to see what effect would thus be produced were it appreciable.

The true cause of the ocean currents is sometimes mentioned in the text-books, but, excepting in two of the most recent ones, is given little or no prominence. The initial cause is the trade-winds. These blowing constantly from the northeast and southeast, induce a drift of the surface water in their directions. These two drifts meeting near the Equator flow along it westwardly, developing into a well-defined equatorial current. In the Atlantic this current, after flowing across the ocean, impinges on Cape St. Roque, Brazil, where it divides. The smaller part turns southward and skirts the coast of South America, fading out near the latitude of Cape Horn. The northern and much the larger part flows through the Caribbean Sea and the Gulf of Mexico, gathering strength and momentum in the narrow passages through which it is forced by the body of water behind it, and enters the Atlantic through the Strait of Florida. Here in the open sea it rapidly widens, shallows, and loses its velocity, and in the middle Atlantic is reduced to a mere drift, gradually turning southward to repeat its long journey.

What takes place in the Atlantic takes place on a much larger scale in the Pacific. Here from all parts of that great ocean within the tropics the surface water is driven to the neighbourhood of the Equator by the trade-winds. Along the Equator it flows for thousands of miles in a great current. On reaching the land it divides, and the southern portion subdivides time after time, and finally is lost among the maze of islands constituting Australasia. The northern part skirts the Japanese islands, gradually turning to the northeast, as it gets under the influence of the prevailing westerly winds, and soon disperses in the great waste of waters of the North Pacific.

These are the great oceanic movements. They are initiated by the winds, and their course is modified by the winds and by the shores. Besides changing the courses of the main currents, the

shores and islands divide the currents, sending off numberless little minor streams of water in various directions.

The land absorbs heat rapidly and as rapidly cools. Water, on the other hand, is heated slowly and holds its heat longer. Moreover, the sea is constantly in motion, its waves, tides, and currents —especially the latter—tending to create a uniform temperature throughout its mass. In consequence of all these conditions the sea has a much more uniform temperature in its different parts, and at different times, than the land. It is warmer in high latitudes and cooler near the Equator; it is warmer in winter and cooler in summer. It follows, further, that the coasts upon which the prevailing wind is from the sea share in this amelioration of climate, while the interior of continents and coasts upon which the prevailing winds are from the land do not share in this amelioration of climate.

Here we have the application of all that has gone before. Upon our northwest coast the prevailing winds are from the west, from the sea, and they bring to the coast the climate of the sea, which is warmer, on an average through the year, than the land, and also much warmer in winter and much cooler in summer. The coast of Europe is under similar conditions, while the east coast of the United States and of northern Asia is under reverse conditions. Here the prevailing winds, still being from the west, come from the land, and they give these coasts a continental or land climate, which is much colder in winter and warmer in summer. As was stated before, the cold climate of the east coast of the United States has been attributed to an Arctic current flowing close inshore. If there were such a current, it could have no effect upon the climate of this coast, since the prevailing winds are from the west, and could not bring the cold of the sea to the land.

There is a widespread notion that, in a mountainous region, all divides between streams must consist of mountain ranges, and in most maps ranges are shown in such positions, whether they exist or not. A mountain range may or may not divide drainage basins, and a divide may or may not consist of a mountain range.

Another mistake is the assumption that the highest peaks are always situated on the crest of the mountain range. This is their most common position, but in many cases the highest peaks are situated on spurs, at a distance from the crest.

We still find on many maps the main system of the Cordillera of North America represented as running in a direct line to the Arctic Ocean, just west of the mouth of the Mackenzie, in defiance of the

well-known fact that the main mountain system follows the coast through Alaska, and forms the backbone of the Alaskan Peninsula.

Many minor errors of a somewhat ludicrous character have been perpetuated in publications of authority, a few of which may be instanced:

For many years a town by the name of Goblin City appeared on the maps, placed on White River in western Colorado. It had no connection with other settlements; and, indeed, there were none within hundreds of miles. An enterprising map-maker, realizing that the inhabitants should have some means of communication with the outside world, made on his map a road from Goblin City eastward to other settlements, and this was afterwards carefully copied on other maps. A scientist who explored this region in 1876 looked for Goblin City, and found it. It was only a bit of Bad Land, to which an earlier explorer had fancifully given this name.

On the map of Colorado to-day appears the name Kahnah Creek, applied to a small branch of Gunnison river. The word *Kahnah*, in the Ute language, means, "I don't know," and was the answer given by an Indian when asked the name of the stream. This story is capped by the name Pah River, applied by an early army explorer to the North Fork of the Gunnison. It seems that, pointing to the stream, the explorer asked a Ute Indian its name. "Pah," answered the Indian. *Pah* is the Ute word for water.

Some years ago a Munchausen tale went the round of the newspapers to the effect that an explorer had discovered in the interior of New Guinea a mountain called by him Mount Hercules, and stated to be 35,000 feet high, thus exceeding Mount Everest in altitude by more than a mile. His narrative lacked certain elements of probability, as, among other things, the discoverer claimed to have climbed the great peak one morning before breakfast in an absurdly short time. His story was quickly discredited, but even now inquiries are frequently made concerning the existence of this purely mythical mountain.

RECENT CENSUSES OF POPULATION.

BY

HENRY GANNETT.

Within the last two or three years most of the civilized nations of the earth have made enumerations of their inhabitants. The results of these censuses are beginning to appear, and comparisons of them with one another and with that of the United States are instructive.

The following table shows the total population of a number of countries, as derived from recent censuses, with the rate of decennial increase and the density of population, expressed in terms of the number of inhabitants per square mile:—

COUNTRY.	DATE.	POPULATION.	PER CT. DECENNIAL INCREASE.	DENSITY OF POPULATION PER SQ. MILE.
United States	1900	76,303,387	21	26
England and Wales	1901	32,523,242	12	557
Germany	1900	56,345,014	14	269
France	1896	38,517,975	0	189
Spain	1900	18,078,497	3	92
Switzerland	1900	3,212,551	10	207
Norway	1900	2,231,395	12	18
Belgium	1900	6,744,532	11	593
Netherlands	1899	5,103,924	13	403
Austria	1900	26,107,304	9	225
Hungary	1900	19,200,000	11	153
Russia	1897	128,932,173	..	15
Sweden	1899	5,097,402	7	30
India	1901	294,266,701	3	188
Japan	1898	43,760,754	..	296
Chile	1895	2,712,145	7	9
Peru	1896	4,610,000	..	7
Denmark	1901	2,447,441	13	160

From the above there appears to be little relation between the density of population and the rate of increase, some of the most densely-settled countries apparently having as great a rate of increase as the most sparsely-populated ones. Thus, England and Wales, Belgium and the Netherlands, which are the most densely-settled portions of the civilized world, are exceeded in rate of increase only by Germany and Denmark among European nations; while, on the other hand, France, which is not a densely-settled country, according to European standards, is not increasing in numbers.

The rate of increase in the United States, although rapidly diminishing, is still 50 per cent. greater than that of any other nation here represented. Of the European nations, Germany shows the most rapid rate of increase, in spite of the large emigration from that country. Spain has practically come to a standstill, its recent census, taken in 1900, showing a few thousand less inhabitants than that taken three years earlier. The recent famines in India are doubtless responsible for the small increase in that country.

The proportion of urban population differs widely in different countries. Measuring it by the population included in cities of 100,000 or more inhabitants, it is seen that this element, which in the United States comprises 19 per cent. of the total population, includes in England and Wales not less than 34 per cent.; while in Belgium it is 18 per cent., in Germany 16, in France 10, in Spain 9, and in Japan 8 per cent. Thus, measured in this way, the United States comprises a larger proportion of urban population than any country in Europe, with the exception of England and Wales.

If, on the other hand, all bodies of urban population be included, which is a much better test to apply, the situation is different. Measured in this way, the urban population of the United States forms 40 per cent. of the total number of inhabitants; while that of England and Wales forms not less than 72 per cent., or nearly three-fourths of the entire population. In Germany and the Netherlands just one-half of the population is included in such urban bodies; in France, Switzerland and Belgium, two-fifths; in Denmark, 30 per cent.; in Norway, 28 per cent.; in Sweden, 21 per cent., and in Russia 12 per cent. Measured by this standard, therefore, the United States is exceeded among European nations by England and Wales, Germany and the Netherlands, and equalled by France, Switzerland and Belgium.

The proportion of urban population is an indication of the relative importance of manufactures and commerce as contrasted with agriculture. These figures emphasize the preponderance in England and Wales of manufactures and commerce, and the growing importance of these industries in Germany. The comparatively low proportion of urban population in France, coupled with its high density of population—far too great for a rural community—serves to explain, in part at least, the cessation of its growth. Rural communities cannot increase beyond a certain density of population. The vocations of the people must change or the population come to a standstill. The policy of the German Government in encouraging manufactures and commerce at the present stage of the development of

this country is a wise one, and the increase of this people in numbers in recent years is a gratifying response to the efforts which the Government is making in this direction.

We see in the United States, among the several States, all stages of this movement, ranging from a prosperous farming State to an over-populated farming State and a prosperous manufacturing and commercial State. By tracing the growth of population in certain of the older States, such as Massachusetts, all stages of this history may be seen in the course of its progress.

By considering these facts it is easy to explain the apparent anomaly of a rapid growth in population in a densely-populated country.

GEOGRAPHICAL RECORD.

Petrified Forests of Arizona.—In the Report of the Smithsonian Institution for 1899, just issued, is Prof. Lester F. Ward's account of the petrified forests in Arizona and their condition at the close of the year 1899.

Silicified wood is found in many parts of Arizona, New Mexico, and Utah, but the particular region known as the "Petrified Forest" lies in the area between the Little Colorado river and the Rio Puerco, 15 miles east of their junction, 17 miles east of Holbrook, and 6 miles south of Adamana station on the Santa Fé Pacific Railroad. It is about 8 miles square.

The region consists of the ruins of a former plain, with an altitude of 5,700 to 5,750 feet above the sea. The plain has been eroded to a depth of nearly 700 feet, and is cut into ridges, buttes, and small mesas, with valleys, gorges, and gulches between.

The strata are of clay-beds, sandstone shales, and massive sandstones. The clays are purple, white, and blue, the purple predominating; the sandstones chiefly of a reddish brown, though some are light-brown, gray, or whitish in colour.

The mesas are formed by the resistance of the massive sandstone layers to erosion, and vary in size from mere capstones to tables several miles in extent, stretching to the east and the northwest. The drainage is to the south, and in the middle of the area is the arroyo, which has been mistaken for Lieut. Whipple's Lithodendron Creek. The valley of this creek broadens out at the southern end; and here lies the principal petrified forest, known to some as Chalcedony Park. The petrified logs are countless at all horizons, and lie in the greatest profusion on the knolls, buttes, and spurs, and in the ravines and gulches, while the ground is studded with fragments of all shapes and sizes, exhibiting all the colours of the rainbow.

At the northern end of the area is another centre of accumulation, and two miles to the southeast a third, which is called the Middle Forest.

All these forests are, geologically speaking, entirely out of place, and the trunks bear evidence of having dropped down to their present position from a higher horizon.

Their original position is not to be discovered by ascending the mesas included in the area (though some of these rise 400 feet above

the bed of the creek), and it is only when the plateau is reached, 700 feet above the valley, that the stratum is found in which the fossil wood is embedded. On the west side the plateau is about two miles wide, and has a western escarpment, with another valley extending both south and west of it. This plateau, or elongated mesa, is highest on its western side, rising to the 5,750-foot contour line immediately above the escarpment; and here is exposed a fine series of petrified trunks fringing the mesa, with many weathered out on the slope or rolled down into the valley. A few feet below the actual summit is a bed, some twenty feet thick, of coarse, gray, conglomeratic, cross-bedded sandstone, at many places in which were firmly embedded logs and branches of petrified wood, often projecting from it in the cliffs and clearly in place. After several days' study on all sides of the area, Prof. Ward became convinced that this was the true source of the fossil wood.

At the extreme northern end of the area is a small mesa, at an elevation of nearly 5,700 feet. It is isolated, and its nearly flat top, of about half a mile in diameter, is a stratum of coarse conglomeratic sandstone, twenty to thirty feet in thickness, and in all essential respects identical with that of the elongated mesa on the southwest side of the area. The petrified wood, though less abundant here, is still common, embedded in the ledges.

One of the most celebrated objects in this whole region is the Natural Bridge. This is a great petrified trunk lying across a cañon 20 feet deep and forming a bridge. It is on the northeast side of the small, isolated mesa. The bed in which the tree lies is the coarse sandstone which holds all the petrified wood, and the Natural Bridge is one of the few logs that are in place.

The trunk is complete to the base, where it is abruptly enlarged, and shows the manner in which the roots were attached. The cañon is about thirty feet wide where it is spanned by the tree in a diagonal direction, with a measurement of forty-four feet between the points at which it rests on the sides of the cañon. The exposed length of the trunk is 111 feet, and its diameter, above the middle of the cañon, is over three feet; and at this point there is no incrustation of sandstone on the tree. As in the case of practically all the petrified logs of the region, there is no indication of limbs or branches at the top.

Many facts stand in the way of the supposition that the trees grew where they are found. It is stated by some writers that stumps occur erect with their roots in the ground, but Prof. Ward was unable to find an instance or to learn of one from the residents

of the country. The one tree which he found standing on end had its roots high in the air.

His conclusion is that the indications point to transportation of the trees by water, their accumulation in masses, and subsequent petrifaction.

Relic-hunters and enterprising manufacturers have done their best to carry off these stones. Prof. Ward talked with a teamster who was employed for a long time hauling trunks out of the upper forest to Carrizo Station, and was told by him that though many carloads had been shipped away there had been left at the station a much greater quantity, which had been carried off piecemeal by visitors.

Prof. Ward recommends that the region of these forests be declared a reserve and protected by law.

According to a report of the U. S. Consul-General at Rio de Janeiro, there are now about 2,700,000 foreigners settled in Brazil. Of these 1,300,000 are Italians, 800,000 Portuguese, Germans 300,000, Spaniards 100,000, Poles 80,000, French 10,000, English 5,000, North Americans 500, and all other nationalities 100,000.

As a rule, the foreigners become Brazilians. The Consul-General declares that a small percentage of the colonists—1 or 2 per cent.—retains foreign nationality.

Commerce of the Patagonian Coast.—The *Bulletin* of the Bureau of American Republics, Vol. X, No. 5, takes from a report of the German Consulate at Buenos Aires some data on the Territories of Chubut and Santa Cruz, in the southern part of the Argentine Republic. These Territories stretch over ten degrees of latitude.

Madrin, the port of the valley of Chubut, is at the head of Golfo Nuevo. In 1899 its exports amounted to 6,000 tons of wheat and 300 tons of wool, besides sheepskins and cattle. The wool is still often packed in bags. The wheat of Chubut is of excellent quality.

The State telegraph line now ends at Madrin, but is to be extended to other southern ports. A railroad is in operation between Madrin and Rawson, at the mouth of the Chubut river, and another, now under construction, will connect Madrin with the salt marsh region of the Valdez Peninsula. At present the bags of salt and the unpressed wool are piled up in the open air on the beach at the Piramides anchorage.

At Puerto Camarones, on the bay of the same name, the wool of the English, Swiss, and German sheep-farmers accumulates for months on the beach, waiting to be shipped.

All these ports are in Chubut.

At Puerto Deseado, the most northern port of Santa Cruz Territory, wool is the chief export.

Puerto San Julian is difficult of access at low tide.

Santa Cruz, at the mouth of the Santa Cruz river, consisted, three years ago, of ten houses. It has now 500 inhabitants and 100 houses and sheds. Its annual export of wool amounts to 1,000 tons, and it imports considerable quantities of wire and corrugated sheet-iron, provisions, lumber, etc.

The back-country, or hinterland, of Santa Cruz, is a magnificent pasture land.

The most southern port of this territory is Puerto Gallegos, with a population of 1,000, and an increasing trade in wool, tallow, prepared and fresh meat, pelts, etc.

These southern Patagonian towns keep up their communication with Europe through Punta Arenas, the thriving Chilian port on the Strait of Magellan.

The Monthly Weather Review, Vol. XXIX, No. 3, condenses the various reports of the storm, with red rain and red dust, throughout southern Europe early in March.

On the 10th of March there was a sirocco, with red dust, in the morning in Sicily, in the afternoon in southern Italy; on the 11th red and yellow dust fell with snow in Brandenburg and Pomerania, with east wind by midday, and on the lower Elbe and Weser with north wind by the evening of the 11th.

Prof. A. W. Rücker, who was at Taormina, reported in *Nature*, of March 28:

> On March 12 the sirocco was blowing and the hills were wrapped in mist, but the fog assumed a yellow hue, and the sun, which at times could be seen through it, was a bright blue; this was caused and accompanied by a copious fall of red dust. Some which I shook off my hat was quite dry, and on looking at it through a low-power lens all the granules seemed to be spherical, except a very few grains which looked like quartz . . . Italian papers state that the dust fell also at Naples and Palermo in such quantities that the streets looked red and the people were frightened.

The dust that fell in Germany was examined microscopically and chemically, and was found to be perfectly similar to the sands of the Sahara.

In Palermo the sky was covered with dark red clouds after 8 A. M. of the 10th of March. The city was bathed in red, and at noon-

time the drops of heavy rain looked like blood. At Naples, about 5.45 P. M. of the 10th, the sky became bright yellow and afterwards fiery red. The clothing of those in the street was entirely covered with dust. It was difficult to keep the eyes open. Nothing like it had been seen in Naples since the eruption of Vesuvius in 1872.

This is the first time that Sahara dust has been known to be carried to England.

La Géographie, of April 15, prints the following comparative table of the commercial movement of eleven ports in Western Europe:

1880.	TONS.	*1890.*	TONS.
London	5,970,341	London	7,708,705
Liverpool	4,913,324	Liverpool	5,782,351
Antwerp	3,063,825	Hamburg	5,202,825
Marseilles	2,769,047	Antwerp	4,506,277
Hamburg	2,766,806	Marseilles	3,458,914
Havre	1,969,857	Rotterdam	2,918,425
Rotterdam	1,681,650	Havre	2,159,213
Bremen	1,169,466	Bremen	1,733,809
Amsterdam	1,076,887	Amsterdam	1,484,250
Bordeaux	1,012,880	Dunkirk	1,256,518
Dunkirk	765,968	Bordeaux	1,091,097
1895.		*1899.*	
London	8,435,676	London	9,437,950
Hamburg	6,254,493	Hamburg	7,765,950
Liverpool	5,598,341	Antwerp	6,872,848
Antwerp	5,322,262	Rotterdam	6,323,072
Rotterdam	4,177,478	Liverpool	6,152,187
Marseilles	3,430,124	Marseilles	4,699,168
Bremen	2,183,274	Bremen	2,406,748
Havre	2,031,023	Havre	2,175,691
Amsterdam	1,281,669	Amsterdam	1,812,500
Dunkirk	1,178,243	Dunkirk	1,365,826
Bordeaux	799,201	Bordeaux	975,102

In the next three or four years London will probably lose the first place. Who would have believed ten years ago that the commerce of Antwerp or Rotterdam would so soon exceed that of Liverpool?

THE CENSUS OF IRELAND.—The returns show a population of 4,456,546; a loss since 1891 of 5.2 per cent.

Leinster has lost 41,297, Munster 98,568, Ulster 38,463, and Connaught 69,876.

Three counties—Dublin, Down, and Antrim—show an increase of 7 per cent. in the ten years. In every other county the population has diminished, the greatest decrease being 19.6 per cent. in Monaghan.

The number of Roman Catholics is 3,310,028, a decrease of 6.7 per cent. in the ten years; the Episcopalians number 579,385, a decrease of 3.5 per cent.; the Presbyterians are 443,494, a decrease of 0.3 per cent., and the Methodists are 61,255, an increase of 10.4 per cent.

Of the cities Belfast shows an increase of 28 per cent., Londonderry 20 per cent., and Dublin 7 per cent.

The Italian Ministry of Agriculture, Industry, and Commerce publishes the results of the Fourth Census of the population of Italy, taken on the 9th of February, 1901, compared with the data of the Third Census, made in 1881:

Divisions.	Population.		Increase.	Yearly Increase per 1,000.
	1881.	1901.		
Piedmont	3,070,250	3,326,311	256,061	4.4
Liguria	892,373	1,080,944	188,571	11.1
Lombardy	3,680,615	4,278,188	597,573	8.5
Venetia	2,814,173	3,130,429	316,256	5.9
Emilia	2,183,391	2,451,752	268,361	6.4
Tuscany	2,208,869	2,548,154	339,285	8.0
The Marches	939,279	1,064,749	125,470	7.0
Umbria	572,060	644,367	72,307	6.6
Latium	903,472	1,206,354	302,882	17.5
Abruzzi e Molise	1,317,215	1,442,365	125,150	5.0
Campania	2,896,577	3,142,378	245,801	4.4
Apulia	1,589,064	1,949,423	360,359	11.9
Basilicata	524,504	* 490,000	* 34,504	* 3.4
Calabria	1,257,883	1,375,760	117,877	4.9
Sicily	2,927,901	3,529,266	601,365	10.7
Sardinia	682,002	789,314	107,312	8.2
	28,459,628	32,449,754	3,990,126	7.3

* In the Basilicata the population diminished. The births for the period 1882–1900 exceeded the deaths by 80,266, but the emigration for the same period amounted to 168,978, and two-thirds of this number settled abroad.

Of the cities Bologna has 152,009 inhabitants, an increase of 28,735; Catania 149,694, an increase of 49,277; Florence 204,950 (increase 35,949); Genoa 234,800 (increase 55,285); Leghorn 98,-505 (increase 890); Messina 149,823 (increase 23,326); Milan 491,-

460 (increase 169,621); Naples 563,731 (increase 69,417); Palermo 310,352 (increase 65,361); Rome 463,000 (increase 162,533); Turin 335,639 (increase 82,807); Venice 151,841 (increase 19,015).

The Census of Austria-Hungary.—The *Deutsche Rundschau für Geographie und Statistik, No. 7, XXIII Jahrgang*, prints the results of the census in Austria-Hungary taken on the 31st of December, 1900, and compared with that of 1890:

	1890.	*1900.*
Lower Austria	2,661,799	3,086,382
Upper Austria	785,831	809,918
Salzburg	173,510	193,247
Styria	1,282,708	1,356,058
Carinthia	361,008	367,344
Carniola	498,958	508,348
Coast Land (Trieste, Istria, etc.)	695,384	755,183
Tyrol and Vorarlberg	928,769	979,878
Bohemia	5,843,094	6,318,280
Moravia	2,276,870	2,435,081
Silesia	605,649	680,529
Galicia	6,607,816	7,295,538
Bukovina	646,591	729,921
Dalmatia	527,426	591,597
Austria	23,895,413	26,107,304

The increase in the ten years is 2,211,891, or 9.3 per cent.

According to the Hungarian official returns, the population of Hungary proper on the 31st of December, 1900, was 16,792,399 (including 100,928 military), and that of Croatia-Slavonia 2,411,132. The percentage of increase in the ten years was: Hungary 10.03; Croatia-Slavonia, 9.5.

The total population of the Monarchy at the close of the year 1900 was:

Austria	26,107,304
Hungary	19,203,531
Occupied Territory (Bosnia and Herzegovina)	1,589,165
	46,900,000

The Hungarian Government intends opening a waterway from the Oder to the Adriatic Sea. This will require the canalisation of the Oder from Kosel to Oderberg, a length of 43½ miles. From

Oderberg the line will cut through the watershed above the Iablunka Pass, continue to Sillein, and reach the Danube at Komorn. It will then follow the Danube to Vukovar and the Samac Canal to the Save river, and along this for 180 miles to Karlstadt, or Brod, on the Kulpa. From Brod to Fiume a canal of 35 or 40 miles in length must be constructed.

The length of navigation from Stettin to Fiume will be 1,370 miles, 870 of which are by natural waterways.

This canal will be of great advantage to the German trade with the Levant, and will make Fiume and Budapest important centres of international commerce. (*Geographische Zeitschrift*, *VII Jahr. 5 Heft.*)

Dr. Theobald Fischer, of Marburg University, publishes in the *Ergänzungsheft*, No. 133, of *Petermanns Mitteilungen* the scientific results of a journey made in Western Morocco in 1899 in company with Count Pfeil and Capt. Wimmer.

Landing at Tangier, Dr. Fischer made some geological excursions in the neighbourhood, and then took ship for Mogador, from which place he followed the route through the Tensift Valley to Marrakesh. Between Mogador and the mouth of the Tensift is the range of the Jebel Hadid or Iron Mountain, 30 miles in length and 2½ miles broad.

The country between the sea and Marrakesh is a characteristic steppe. From Marrakesh the march was to the eastward as far as Demnat, which is situated on an outlier of the Atlas at an altitude of 3,200 feet. Here Dr. Fischer turned to the north to the Umer-Riba. This valley, like that of the Tensift, is cut through a steppe. Beyond this, still to the north, begins the zone of cultivated land, of an amazing fertility, parallel with the coast from El-Arish to Mogador, and with a breadth of between fifty and sixty miles.

Following the coast, the expedition returned to Tangier.

What Dr. Fischer calls the *Vorland* of the Atlas is divided into three natural zones: that of the oases, watered by the streams from the Atlas, and inhabited by an industrious population, who live on the products of their orchards; the steppe region, partly mountainous and furnishing pasturage for flocks and herds; and then the cultivated strip along the coast, which Dr. Fischer will study in a new expedition to be sent out by the Hamburg Geographical Society.

In 1892 the interior of Dahomey was an unknown country, but its exploration, begun immediately after the war, has now been nearly completed.

Lower Dahomey was first mapped. The capture of Behanzin opened the country of the Mahis. The establishment of the post of Carnotville, in 1894, was followed by the exploration of Gurma and by the surveys made between Carnotville and Bussa on the Niger, the place where Mungo Park met his death. Lieut. Hourst's Niger expedition completed the topographical reconnoissance of Upper Dahomey; and in 1896–97 the central regions, Borgu and middle Gurma, were explored by Captains Baud and Vermeersch, who determined the orography of the Atakora Mountains, the watershed of the country. From this mountain-knot, rising to a height of a little more than 3,000 feet, flow the streams which find their way to the Bight of Benin, to the Volta river, and to the Niger. By the junction of Capt. Baud's party with that of Voulet the Dahoman routes were united with those of the French Sudan.

A map of the country of the Baribas, the work of Lieut. Boissonas, fixes the course of the affluents of the Niger between Say and Ilo, and corrects the positions of the kingdoms of Bonay and Kandi. The points of the Franco-German frontier between Dahomey and Togo have been marked. With the surveyed line of the future railroad to the north, and the delineation of the Franco-English frontier, between Dahomey and Lagos, there will be nothing wanting to acquaintance with the geography of Dahomey. (*Revue Française*, *Avril.*)

The twenty-ninth issue of the List of Chinese Lighthouses, Light-Vessels, Buoys, and Beacons, published by the Imperial Maritime Customs, gives the name and location of 112 lights along the coast and in the Yangtze river, from Hoi-how, in the island of Hainan, to Newchwang, in Manchuria. There are also 87 buoys and 78 beacons.

The Peary Arctic Club's Expedition.—Mr. H. L. Bridgman, Secretary of the Peary Arctic Club, sends the following communication:

New York, *June 12, 1901.*

To the Members of the Peary Arctic Club:

The following memorandum is respectfully transmitted for your information. Mail for Etah, Greenland, and all points north, will close at the Standard Union office at noon, July 10.

H. L. Bridgman,
Secretary.

The Peary Arctic Club has entrusted to its secretary, Herbert L. Bridgman, the command of its expedition of 1901, the fourth of the series since Mr. Peary departed on his attempt to attain the Pole. This will be Mr. Bridgman's third cruise to the Arctic, the first having been as a member of the Falcon Auxiliary Expedition of 1894,

and the second in command of the Diana Expedition of 1899. Dr. Frederick A. Cook, of Bushwick Avenue, surgeon of the first Peary, 1891, and of the Belgian Antarctic Expedition, has accepted the position of surgeon, and will, on the cruise, prosecute his studies of the ethnology of the Arctic highlanders of North Greenland. The club's chartered steamer *Erik*, formerly the property of the Hudson Bay Company, now belonging to Capt. James A. Farquhar, of Halifax, N. S., having been thoroughly overhauled and refitted, is now on her way from London to St. Johns, N. F., where the captain and crew will be shipped, whence she will proceed for Sydney, C. B., for coal and supplies, taking her departure from that port direct for the North about the middle of next month. A touch of romance is connected with the *Erik's* service, her owner and commander for next summer first meeting in Halifax, N. S., in June, 1897, the captain at that time commanding the mail steamer *Harlaw*, which was then in port. A year later Capt. Farquhar's *Newfoundland*, laden with flour, sugar, pork, and other stores, while in Cuban waters looking for a cargo of sugar, was seized by a United States gunboat as a blockade runner and towed into Charleston, S. C. The secretary of the Peary Arctic Club telegraphed to Capt. Farquhar offering assistance, which was not, however, availed of, and after due investigation the *Newfoundland* was released. But out of the incident grew a friendly relation, which culminated in the placing of the *Erik* in the service of the Peary Club. Capt. Farquhar will take stores for one year to guard against any possible detention, and will, with authority from the Royal Greenland Trading Company to land, call at Godhavn and Upernavik, the most northern stations for any possible information of Peary. The *Erik* is certified by the highest marine authority in London to be in the best condition and well adapted for her Arctic work, and is pronounced by Capt. Farquhar to be in every respect superior to the *Hope* or the *Diana*, which have both been used in the Peary service. Capt. Grey, master of the *Erik* for more than fifteen years, says that she is a very fine sea-going ship, and does good work in the ice. George H. Carr, a member of Peary's 1893–94 party, after a personal inspection the other day of the ship, reports :

"Beginning aloft, so far as I could ascertain, all of the rigging, spars, masts, etc., are in first-class condition. The foremast and mainmast are entirely new, and the mizzenmast is, I understand, only two years old. In the forecastle the crew's accommodation is far better than that in the *Falcon*, being much lighter and better laid out. The forecastle contains sixteen berths and room for a good, large stove for winter use. Under the crew's quarters is a large stock room, which, of course, will come in very handy. There is also a carpenter's shop and blacksmith's shop, both of them limited in size. In addition to the crew's quarters in this part of the vessel there is sufficient room for about eight other persons, and I take it that these quarters would be used by the officers of the ship, since there is no deck-house, as was the case in the *Falcon*. The hold of the ship is quite large and roomy, and well reinforced throughout with heavy timbers, which have evidently been recently put in. The ship's sides are, I understand, double-sheathed, and therefore in pretty good shape to stand an ordinary ice squeeze. A pair of new knee braces had been put in. The cross timbers in the hold are of good, solid oak, although looking somewhat the worse for wear. The ship is quite tight and makes no water; in fact, when I was in the hold there was little or no bilge to be seen. The bridge is wider than was the *Falcon's*, and the officer's quarters in the afterpart of the ship are more conveniently laid out than in the *Falcon's*, the captain's room being especially large and roomy; it not only boasts of a washstand, but quite a large couch also. There are about six feet of space between the berth and the door. The three other cabins leading off the saloon are

fitted with double berths, and are also much roomier than were our quarters on the *Falcon*, where one of us turned out at a time in order to dress. The *Erik* has a complete new suit of sails; this is in addition to her present suit. The chart-house, which is situated under the bridge, is very small. However, there is room in it for a single berth. The engines are being thoroughly overhauled, the condensers going through a thorough state of cleaning, scraping, etc. Six tons of coal per day give an average of 7½ knots per hour. This is about the same speed as the *Falcon*. Peary has already seen the *Erik*, and in fact wished to buy her from the Hudson Bay Company prior to Harmsworth's gift of the *Windward*. Capt. Grey, who has always sailed this ship, states that she is very easily handled in the ice. She has a double wheel to her rudder, thus allowing four men to handle her should a necessity arise."

The provisional project of the cruise, so far as arranged, is as follows:

1. Leave Sydney, C. B., July 15, or as soon after as practicable, and proceed as rapidly as possible to Etah, North Greenland, mailing home letters from Domino Run or other convenient Labrador port, and Godhavn, and calling at Cape York, Saunders Island, and other native settlements for news from Peary.

2. Effect junction at earliest possible moment with *Windward*, deliver mail, and, if necessary, transfer stores and coal.

3. Peary's verbal or written instructions will supersede the foregoing, and are, as far as possible, to be fully and faithfully performed.

4. Relieve Stein's Fort Magnesia, Payer Harbour, Bedford Pim Island, unless earlier meeting with Stein and Warmbath should render this unnecessary.

5. Deliver mail for the *Fram* at most convenient point without interfering with the general duties of the expedition.

6. Furnishing directly or indirectly written or photographic matter for publication; trading with natives, scientific or sporting excursions, except by express permission by representative of Peary Arctic Club, are forbidden.

7. Leave Etah for Northern port, Aug. 27 or 28, and return to reach Sydney not later than Sept. 15.

8. Subject to the discipline of the ship and the conditions of navigation, the authority of the representative of the Peary Arctic Club is paramount, and in event of his disability, and in absence of other directions from Peary, shall devolve upon surgeon, and then upon the captain and officers in order of rank.

The summer of 1901 is likely to mark the culmination of the work of the Peary Club, though its members, confident as they have been from the outset in Mr. Peary's success, are pledged to stand by him unfalteringly to the end. Three years have elapsed since Mr. Peary left America, and two full seasons' work is to be learned upon the return of the *Erik*. More interesting, in a personal and dramatic way, than the geographic work of Mr. Peary, is the fate of his wife and daughter and of the steamer *Windward*, from which nothing has been heard since her departure from Godhavn, Greenland, Aug. 20, 1900. Expectations and instructions then were that the *Windward*, with Mrs. Peary and Miss Peary, would return in the autumn, and the hope now is that their detention was due to Mr. Peary's orders, and for reasons which were satisfactory to him. The *Erik* will take to Mr. Peary, for the first time, news of the death of his mother in Portland, Me., last November; of the Baldwin-Ziegler Expedition, and many other facts of personal and general interest. Prof. L. C. Stone, of the Polytechnic Institute, and Herbert Berri, his pupil, of Brooklyn, son of Mr. William Berri, will be guests of the Peary Arctic Club on the cruise.

The Baldwin-Ziegler Polar Expedition.—Prof. E. B. Baldwin, the leader of this expedition, left New York on the 14th of June, in the *Friedrich der Grosse*, accompanied by Mr. William Ziegler, who supplies the funds for the enterprise.

It is understood that the start will be made in July from Tromsö, Norway, and that a base will be established in the Franz Josef archipelago.

Practically all that is known as yet of the plans is contained in the following report of Prof. Baldwin's remarks at the dinner of the Arctic Club on the 24th of May. In accepting an American flag presented to him, Mr. Baldwin said:

> I am firmly convinced that this flag will be carried to victory in this expedition. I am unable to say much at this moment of the plans which have been decided upon. The starting-point will be Franz Josef Land, and our party will be sufficient in number to avail ourselves of every resource in the land, in the way of food, by hunting bears and other animals. We shall begin our journey across the ice with 400 dogs and fifteen Siberian ponies, and with the assistance of these I believe it will be possible to achieve the object we shall set out to accomplish. With the proper management of our large pack of dogs I don't see why we should not succeed in carrying the Stars and Stripes to the North Pole. We also hope to do a great deal of scientific work. Comrades will be engaged for this branch of our operations who have had Arctic training. I would like to be able to name the men who will comprise our party, but there are several reasons which prevent me making known the personnel of the expedition at this time.

The expedition is supplied for three years, though it is said that Mr. Baldwin expects to reach the Pole and return within twenty-seven months.

At the end of two years a supply of food and material will be sent to Franz Josef Land, and the party will remain in the Arctic until its purpose is accomplished.

The daily papers published on the 12th of June the following dispatch:

> Quincy, Ill., June 1.—Forty balloons have been shipped to Tromsö, Norway, where the outfit will be added to the equipment of the Baldwin-Ziegler North Pole expedition.
>
> These are not for carrying passengers, but to mark the path of the expedition. To each will be attached ten buoys, ten feet apart, hanging one below the other, weighing ten pounds each, and arranged with a liberator for detaching the buoys one at a time as they strike the earth. Each buoy will contain a message, showing the latitude where the balloon was sent up, and such other words as the explorers care to leave behind.
>
> The buoys are made of copper and cord, and are shaped like a top. In the centre is a hollow space, which will contain the messages. When a certain amount of gas has escaped the balloon will descend. As soon as it gets near enough to the earth for one of the buoys to strike, the lower one is immediately detached, and, liberated from the weight, the balloon at once begins another ascent. This operation is re-

peated automatically, until all of the buoys have been dropped, when the balloon, now emptied of its gas, collapses, and sinks to the ground. As there are forty of these, this operation will be continued until the 400 buoys are scattered over the Arctic regions.

NINE EXPEDITIONS are now in the Arctic, or on the way thither :

R. E. Peary's expedition, including the *Windward.*

Admiral Makaroff's party in his ice-breaker.

Robert Stein's party in Ellesmere Land.

Capt. Sverdrup's expedition in the *Fram.*

The search-party, led by Mr. Stökken, to learn the fate of the three men lost from the *Stella Polare.*

Capt. Bernier's Canadian expedition, following the route of the *Jeannette.*

Baron Toll's expedition to the Taimyr Peninsula.

Capt. Bauendahl's party in the fishing-boat *Matador.*

The Ziegler-Baldwin polar expedition.

M. FROIDEVAUX'S PARIS LETTER.

PARIS, May 20, 1901.

The oldest and the most important of all the geographical institutions of an official character existing in France is the Geographical Service of the Army, which depends upon the Ministry of War. I propose to sketch the history of this institution for the members of the American Geographical Society, reserving for another letter an account of its present organization.

The name which it now bears is of recent date. Up to the year 1887 it was known as the *Dépôt de la Guerre*, the designation bestowed at the time of its creation in 1688 by Louvois, the Minister of Louis XIV. The original Dépôt de la Guerre was, however, nothing more than a repertory of documents collected from the archives of the Ministry of War and specially relating to military history and operations; its director (who took charge in 1736) did not in any way concern himself with questions of topography. So matters remained until 1761, when the Dépôt of Maps and Plans was annexed to the Dépôt de la Guerre, in which were then brought together very valuable collections of printed and manuscript topographical drawings, the work of the military engineers in the reigns of Louis XIV. and Louis XV.

The history of this body—the *Corps des Ingénieurs des Camps et Armées*—would be curious and most interesting from a geographical point of view, and I may perhaps return to it in studying the origin of the map of the General Staff. At present it is enough to say that in 1761 the Dépôt de la Guerre did not undertake the production of maps. It was not until 1793, when the National Convention confided to it the retouching and the completion of the great geometrical map of France, known as the Cassini map, that the Dépôt de la Guerre took a new form. A former geographical engineer, Calon, a member of the Convention, held the office of director until 1797, and under him was organized for the first time a studio of topographical engraving, which has worked without interruption to the present day.

For a long time the Dépôt de la Guerre had its own individual government, but in 1845 it was attached to the central administration. It formed a special department in the Ministry of War down to the year 1871, when it was attached to the General Staff of the Minister—at first with the title of Fifth Bureau, afterwards with

that of Sub-Direction, and at last it received in 1887, when it had existed for 200 years, its present name.

The character of its work will be treated hereafter. A few figures will sufficiently indicate the importance of this establishment, as regards cartography, in the course of the XIX century.

In 1801 the Dépôt de la Guerre possessed and kept on sale 6 engraved maps; in 1889 it had 250, embracing 1,800 plates, the issue of which has gone on increasing, so that, according to the notice published at the time of the Exposition of 1900, nearly 900,000 sheets were sold in 1899, partly to regular agents, partly for purposes of study or for field manœuvres.

The Thirty-ninth Session of the Congress of Learned Societies, organized by the Ministry of Public Instruction to meet every year, either in Paris or in some important city of France, was held at Nancy on April 9–13.

In two of the sections—that of the Sciences and that of Historical and Descriptive Geography—some communications deserve particular mention in this place.

M. Julien Thoulet, whose work in oceanography is universally known and appreciated, presented his superb lithological map of the French coasts and a very interesting map of the Azores. M. Bouquet de la Grye, the distinguished hydrographical engineer, who has lately made a series of exact observations on the currents along the western coasts of France, explained his inability to find in the experiments made by the Prince of Monaco anything more than meteorological indications ; the floats dropped from the *l'Hirondelle* and the *Princesse Alice* giving in reality only the direction of the wind, and not in any sense that of the marine currents.

M. Emile Belloc, well known to Alpinists for his geological and limnological studies in the Pyrenees, described his patient and careful researches on the circulation of subterranean waters.

In local and regional geography, M. Auguste Pawlowski submitted a study of the bay of Poitou, presenting exact information and new facts in topography and toponymy; M. L.-A. Fabre read a paper on the Adour and the plateau of the Landes, and M. Turquan a study of the migrations from department to department in France.

Particular attention was naturally paid to Lorraine. M. Pierre Boyé wrote on the Hautes-Chaumes of the Vosges; M. Bleicher* pre-

* This eminent man of science, the head of the School of Pharmacy in the University of Nancy, was killed in that city on the 8th of June. The telegram printed in the London *Times* of June 10 says : "He was murdered yesterday by M. Ray-

sented several geological studies of the plateau, as well as of the age and the formation of the valleys of the Meurthe, the Moselle, and the Meuse through the oölithic barriers, etc.; and several engineers gave the results of economical studies. M. Villain, for instance, demonstrated the extreme richness of the mining basin of Lorraine (5,000,000,000 tons), the richest in the world after that of Lake Superior, and pointed out the great facilities which exist in Meurthe-et-Moselle for development. M. Arth described the importance of the metallurgical production of Lorraine, M. Petit the brewing industry in the east of France, and M. Lebrun defined the salt basin of Lorraine as almost coincident with the Triassic, and considered the salt question in the department of Meurthe-et-Moselle. Exclusively geological papers were those of M. Bresson on the structure of the ancient *massif* of the Hautes-Corbières, M. Fabre on the Pyrenean origin of the magnetite in the sands of the Garonne, and M. Belloc on the lacustrine bars in the region of Oô, Department of Haute-Garonne.

M. Pawlowski described his discovery of a number of original maps by the geographer Claude Masse; and Dr. Hamy, President of the Société des Américanistes, communicated a series of interesting unpublished documents which clear up a number of points hitherto little known concerning the French expeditions to Florida, and particularly with regard to Laudonnière. Among these is a miniature found by M. Schlumberger at the chateau of Courance; it is the work of Lemoyne de Morgues, one of the artists who illustrated the De Bry collection. The miniature represents Laudonnière with the Indian Chief Satouriona before the stone pillar with the arms of France, set up by Jean Ribaut in 1562 before his departure for France. M. G. Saint-Yves spoke of the papers of Dumas and their importance for the history of the loss of Canada, and analyzed a portion of the correspondence of Patoulet relating to the French Antilles under Louis XIV. M. G. Musset traced, with the help of new documents, the history of the foundation of New Orleans; and Messrs. A. A. Fauvel and Henri Froidevaux spoke of some points, as yet little known, in the ancient explora-

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mond Four, a chemist, a sample of whose cinchona had been seized for analysis at the school, and who, dreading the results of prosecution for fraud, decided to hold the director of the school responsible for his humiliation and mischance. He called yesterday upon M. Bleicher, and after a long interview shot him dead and then committed suicide."

This crime recalls that of Prof. Webster in the chemical laboratory of Harvard University, in 1849.—(Ed. BULLETIN.)

tion of Africa. Messrs. Jules Beaupré, Henri Javard, and Collinet treated subjects of historical geography.

Among the visits and excursions particular mention must be made of that to the remarkable oceanographical laboratory organized by M. J. Thoulet at the Faculté des Sciences, of Nancy. It is to be regretted that the question lately raised in the *Annales de Géographie*, by M. Bleicher, was not taken up at Nancy; a boring made would have enabled the geologists and geographers present to discuss the matter on the spot, and to find a solution of the question whether the Moselle has really been captured by the Meurthe to the detriment of the Meuse.

Simultaneously with the meeting of the Congress at Nancy the International Association of Merchant Shipping celebrated its first meeting at Monaco, from the 12th to the 15th of April, and the Prince of Monaco announced that the sum necessary for the foundation of a meteorological and oceanographical observatory at the Azores had been voted by the Portuguese parliament, and that the first stone would be laid by the King of Portugal in the summer.

The principal geographical event, since the date of my last letter, is the reception of M. Gentil, explorer of the Shari river and Lake Tchad, and Capt. Joulland, the head of the Central African expedition, by the Société de Géographie. The meeting took place on the 14th of May at the Sorbonne, under the presidency of M. A. Grandidier.

M. E. Gentil explained in a masterly address the occupation and the organization of the territories on the Tchad—that is to say, the countries between the 10th degree of N. latitude and the left bank of the Ubangi. To the south are the civil territories, now fairly well known in their details, and M. Gentil now sets before us the delimitation of the river basins, the Kemo, the Nana, the Gribingui, the Ombela, and the M'Poko, the identification of the Bahr Sahara with the River Wam (already partly ascended by M. Perdrizet), and the determination of the navigability (for canoes) of the Fafa, affluent of the Wam. The principal ethnic groups in the civil territories, where the density of population is from 18 to 25 per square mile, are the Banda, the Mandjia, and a part of the Sara. All the tribes of the country are pagan; the Banda the most intelligent and the most warlike, the Mandjia the most industrious, of the natives. Between the southern frontier of Baghirmi and the civil territories lie the military territories, peopled principally by Mohammedans, who have been studied by Captains de Cointet, de Lamothe, and Galland.

A plan of the Shari at the stage of low water completes that made of the river at full in M. Gentil's first journey; and a new advance was made to the Tchad, the waters of which are navigable at every season for those who do not approach the shore nearer than two or three miles, at which distance there is a depth of ten feet, increasing to much more farther out and on the west side, while there are numerous sandbanks on the east. Unfortunately, M. Gentil was not able to go to the islands in the lake where the Bouddouma pirates live.

The greater part of the principal positions, nearly 200 in number, has been astronomically determined, and the map now in process of execution at the Ministry of Colonies will repose upon a scientific basis, and cannot fail to be of great service for the study of these regions, which are described as abounding in cattle and in all kinds of grain, while the numerous population produces leather and manufactured stuffs, and consumes European goods, sugar, coffee, tea, hardware, perfumes, soaps, etc.

Capt. Paul Joalland, who succeeded M. Gentil, explained how, after the sad events of July 17, 1899, and the departure of Lieut. Pallier, he considered it his duty to continue his march to the eastward. After having reorganized at Zinder the Voulet-Chanoine mission, he set out, October 3d, towards Lake Tchad, where he arrived, completing on the way his study of the Franco-English frontier in the Sudan. He then passed round the northern, eastern, and southern shores of Lake Tchad, effected a junction with the parties of Foureau and Gentil, and co-operated in the destruction of the empire of Rabah. In this way was realized, point by point, the programme laid down by the French Government for the regretted Col. Klobb.

Captain Joalland did not state the geographical results of his journey, and it will be some time before they are known. It is possible, however, to note in his account something of the races of the countries visited in Central Africa, and some economical facts on the country of Zinder, of which a nearly complete map has been drawn. It is, in the words of the traveller, the pearl of the French colonial empire in Central Africa, a country with an admirably healthy climate and a rich soil, in which wheat, the lemon tree, millet, maize, rice, the date-palm—in a word, all the products of the Sudan—grow in abundance. Captain Joalland believes that it has before it a great future, if not for large colonial enterprises, at least for the smaller proprietor.

A communication made by M. de Lapparent, both to the Académie des Sciences and to the Société de Géographie, is on the dis-

covery of a fossil bear by Col. Monteil on the 11th of September, 1892, in the Sahara, at Zau Saghaïr, in 18° 23′ 08″ North Latitude. In the discovery of this bear, picked up at the point where Gerard Rohlfs indicates the existence of *fossils*, M. de Lapparent sees a precious confirmation of the distinguished German's note; from the fact of the presence of this fossil in the eastern Sahara he concludes that there has been an error in regarding Africa as a rare example of continental stability indefinitely maintained. To-day (he writes in *La Géographie* for April) we are obliged to admit that in the Cretaceous epoch the territory of north Africa was greatly reduced; and as we know absolutely nothing of the geology of the countries situated between the Tchad on one side and the Kamerun and the Congo on the other, there is nothing to forbid the supposition that through some strait the Saharan gulf, which reached the region of the Tchad, might be in communication with the seas which bathed at the same moment, one, the coast of Libreville, the other, Shoa and the country of the Gallas. Such is the interesting statement made by M. de Lapparent. It was not received without scepticism and protest. Was this bear *in situ*, as the learned geologist affirms; or was it not carried by a caravan to the spot where Col. Monteil saw it before him and picked it up? This question is of capital importance, and it is only, as M. de Lapparent has very well said, from a detailed exploration of the strata scattered between Agadem and Bilma that we can look for its solution. In any case here is a new geological and geographical problem clearly stated, a new point to which the attention of the travellers in the Sahara is called. Perhaps—for the question has its interest on the other side of the Tchad—the specialists who accompany Comm. Destenave in the territories between the Ubangi and the Tchad will find there precious elements for the solution of this problem.

It is proper to say something of newly-formed expeditions. Dr. F. Weisgerber, whose interesting studies on Morocco have been previously noted, has published in *La Géographie*, with a map, a very good itinerary from Salé to Tangier by Mequinez, Fez, Alcazar, and Tetuan. Col. Peroz, who was charged with opening a route from Saï to Zinder through French territory, began by organizing the western part of the military territories in the French Sudan. Not content with bringing under the domination of France a population of more than 100,000 souls, he drew a map of the country, pushing his reconnoissances in every direction, and established the centre of administration at Sorbo-Haoussa, a village on the Niger a little below Sansané-Haoussa.

M. Charles-Eudes-Bonin has just set out for eastern Asia, where he intends making a new journey of exploration.

M. Piroutet has gone to New Caledonia for the purpose of studying the geological construction and the principal mining centres. He is to inspect the regions thought to contain mineral riches, and to construct a complete geological map of the colony.

Comm. Bourgeois, the head of the Commission to revise the arc of the meridian at Quito, has taken his departure. We shall report with care to the American Geographical Society the progress of this important operation.

No geographical publication seems to call for particular mention at the moment; but it is well to record a modification in the aims of the *Revue de Géographie*, resulting from the death of its founder, the regretted Ludovic Drapeyron. When he began the publication, in 1877, he designed to make it an organ of sound, popular instruction in geography, but he had been brought, by absorption in his professional duties in a lyceum in Paris, to devote much space in the *Revue* to studies in the history of geography and to historical geography.

As now published the *Revue* is edited by a committee, composed of General Niox, Emile Levasseur, of the Institute, Prince d'Arenberg, president of the Comité de l'Afrique Française, and M. Charles-Roux, president of the Comité de Madagascar. The secretary is the erudite and well-informed M. G. Regelsperger, who devotes his attention to questions of the present day, to the exclusion of purely retrospective studies. From this time on, therefore, the *Revue de Géographie* will publish papers on descriptive and economical geography, and will keep its readers informed of the progress in the knowledge of the globe, and the part taken by each people and race and the methods employed by them in developing and increasing the value of their domains.

This programme has been strictly followed since the month of March; yet, for our own part, we must regret that the *Revue* has so completely broken with what but recently constituted its principal merit. Henceforth it is to the *Bulletin de Géographie Historique et Descriptive* alone that we must look for the regular publication of studies in the history of geography and historical geography.

The summary report of proceedings at the Eighth International Geological Congress, held in Paris, August 16–27, 1900, has just been distributed. Necessarily brief as the notices are, they show the interesting character of the papers, such as that of M. Bleicher on the Denudation of the Vosges, those of M. Flamand (on the

Geology of Southern Algeria and the Saharan Regions), those of M. Douvillé (on M. de Morgan's Explorations in Persia and on the Jurassic Terrain in Madagascar), and that of M. W.-F. Hume on Sinai. There may be occasion to consider somewhat more at length the facts presented in these several studies when the detailed Report of the session is issued.

HENRI FROIDEVAUX.

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BOOK NOTICE.

Tarr and McMurry's Geographies. Third Book, Europe and other Continents. The Macmillan Company, New York, 1901. 12mo, pp. 574, figs. 436.

The authors of this book are Professor R. S. Tarr, of Cornell University, and Professor F. M. McMurry, of Teachers College, Columbia University. This volume completes the proposed series for grade schools. Volume 1, Home Geography and the Earth as a Whole, and Volume 2, North America, were noticed by the present writer in this *Bulletin*, Vol. XXXII, 1900, pp. 388–390. The same modern point of view and the same attractive excellence characterize this, as the earlier numbers of the series. If such a course as is here outlined could be well taught in the grades more advanced work could be offered in the high schools than now seems possible.

Part I of the volume before us, comprising 95 pages, is devoted to a review of general geography. The instruction is, however, carried to a more advanced point than in the previous volumes. Thus, bare review and mechanical repetition are avoided. A very valuable feature appears as soon as the continents and their countries are taken up, viz.: constant comparison of the facts and principles found in other parts of the world with similar matters in the United States. This method is emphasized by a series of questions at the close of the treatment of each continent.

The space seems to be well allotted, as follows: General Physiography, 95 pp.; South America, 53 pp.; Europe, 204 pp.; Asia, 62 pp.; Africa, 46 pp.; Australia and Island Groups, 25 pp.; Review of North America, chiefly of the United States, 37 pp.; Comparison (partly diagrammatic) of the United States with other countries, 19 pp. There are appendixes of references and statistical tables, and the index is also a pronouncing vocabulary.

The illustrations are very abundant. While, as a whole, they are highly useful and interesting, it would, perhaps, have been well if the authors had attempted a little less and had secured a higher average of excellence. A number of views, containing human figures, are too much reduced. Such are figs. 47, 51, 52, 97, 180, 267, 305, 307, 334. Other illustrations are open to the same criticism, as the tropical forest, fig. 40; the Bolivian plateau, fig. 79;

tropical forest, fig. 86; City of Caracas, fig. 96; cliff dwelling, fig. 160; the Alhambra, fig. 165; the Berlin map, fig. 196; Paris map, fig. 162; Lake Lucerne, fig. 205; Hungarian Plain, fig. 223; Olive grove, fig. 240; farm house in Thibet, fig. 245.

Both the coloured and the relief maps are good in expression and attractive to the eye. In one or two cases map questions are asked, for which the maps themselves afford inadequate data. This is seen in the questions on p. 301, relative to the rivers and lakes of the Alps. One or two slips were observed. Thus, Lake Lucerne can hardly be called "star-shaped" (p. 308) when taken as a whole.

These minor criticisms, however, in no way obscure our appreciation of the excellence of the work. A reading of the several chapters will show the careful attention given to this preparation, the fullness of fact, and the adaptation to the work of the classroom.

We have space for but an illustration or two. Take, for example, under South America, the account of Argentina, the reasons for its growth as compared with Brazil, the comparison of the pampas with the North American prairies, and the discussion of the development of Buenos Ayres and New York. Or, if we select Germany, we find a good review of her growth, her enterprise, and of the latter as related to public education. How fresh and modern the story is appears in the emphasis placed on the beet-sugar industry, forestry, the rise of commerce, and the growth of German cities. It will be interesting to see whether such an excellent series of geographies will be hampered in their introduction by comparison with books of the old atlas form which have so long held sway in American schools.

A. P. B.

NOTES AND NEWS.

Dr. Reginald A. Daly has given up his projected expedition to Labrador, Greenland, and Iceland.

The International Congress of Americanists will hold its Thirteenth Session in the City of New York in 1902.

The Anthropological Section of the American Association for the Advancement of Science, at its last meeting, appointed Messrs. F. W. Putnam, of the American Museum of Natural History, J. W. Powell, of the Bureau of American Ethnology, and G. A. Dorsey, of the Field Columbian Museum, a committee to organize a General Committee throughout the country to prepare a programme for the meeting.

The Royal Netherlands Geographical Society is organizing an expedition, under the charge of Major L. A. Bakhuis, to explore the valley of the Kopename river, in Dutch Guiana.

The Survey of Greece, interrupted by the war with Turkey, is now resumed under the direction of Prof. Hartl, of the University of Vienna.

Dr. Robert Bell, for more than forty years a member of the staff of the Geological Survey of Canada, succeeds the late George M. Dawson as Director of the Survey.

Prof. George Davidson, of the University of California, contributes to *Mazama*, for April, the explanation of a map of the rivers, lakes, trails, and mountains from the Chilkaht river to the Yukon, drawn for him by the Chilkaht chief Kohklux.

This chief planned and carried out in 1852 the destruction of the Hudson's Bay Company's station at Fort Selkirk because the agents of the Company had interrupted his traffic with the Indians of the interior. In 1869 he was a captive at Sitka, where Prof. Davidson, then on his way to observe the solar eclipse of August 7, made his acquaintance.

Kohklux, when released, promised assistance and protection to the eclipse party, and fulfilled his promise in spirit and in letter. He was honest as well as truthful, and not a single article was lost by the white men during their stay at his strong village of Klu-kwan.

The map was drawn by Kohklux and his two wives on a sheet of paper, 43 x 27 inches, and it cost two or three days' labour. Prof. Davidson finds it important in a number of places for the Indian names of natural features, and he has embodied its information in the map accompanying his paper.

The computation of time from midnight to midnight and from one to twenty-four o'clock, adopted in Spain on the 1st of January, 1901, seems to be a working reform.

It was on the 1st of January also that the Sociedad Geográfica de Madrid became the Real Sociedad Geográfica, and in the reports of its meetings, always held at night, are the recurring formulas:

Abierta la sesión á las 21^h 30$'$;

Y se levantó la sesión á las 23^h.

These hours are quite as readily understood (in print) as 9.30 P.M., and 11 o'clock, P.M.; but it must be long before the new expressions pass into the daily speech.

The Geographical Society of Lisbon celebrated in April the twenty-fifth anniversary of its foundation. A special commemorative *Boletim* has been issued, giving a brief history of the Society and lists of its officers from 1875 to 1901, with illustrations of its handsome and commodious house.

The membership roll on the 3d of April showed 2,967 names, of which 662 were those of corresponding members.

The Rev. Dr. Eitel makes his contribution to the study of *China and the Far Eastern Question* in the reprint of a lecture delivered before the Royal Geographical Society of Australasia (S. A. Branch) at Adelaide, in July last. Dr. Eitel has lived among the Chinese for thirty-five years and has studied with assiduity their life and language and literature, and his conclusion is that when Europeans have learned all they can learn of China they will know very little about the Chinese as a people.

The charity boy is said to have made a similar reflection, after wrestling with the difficulties of the alphabet, and it must be admitted that intimate acquaintance with China and Chinese ways calls for the devotion of a lifetime. How much less than a lifetime will enable an Englishman to sympathize with French, or Italian, or German habits of thought?

Nations, like individuals, rarely learn to know each other well, but they can learn to respect each other's rights and to dwell together with an approach to comity.

Such a relation must seem desirable to Dr. Eitel, yet he permits himself to write of the duty of the allied Foreign Powers to depose Chinese officials, to establish an International Council of State in the Empire, and to take other measures for the government of a country and a people in every way strange and remote to him after the assiduous study of thirty-five years.

Dr. E. Bretschneider, the distinguished Chinese scholar, for many years physician to the Russian Legation at Peking, died in St. Petersburg early in May, at an advanced age. He has written much and well. One of his latest works is a *History of European Botanical Discoveries in China*, in two volumes, published in English at St. Petersburg in 1898. His Map of China, in four sheets, to illustrate this History, was issued at first in 1896. Five supplementary maps were added in 1898, and a second thoroughly revised and enlarged edition of the four-sheet map was brought out in 1900.

General Derrécagaix has made a survey (in *La Géographie*, Nos. 5 and 6, 1901) of the maps of European countries, and their state of advancement in 1900.

The map of Germany is nearly completed, on two scales: one of 1:25,000, as mathematically exact as possible; the other of 1:100,000, more particularly reserved for military purposes.

Austria-Hungary possesses, in the Military Geographical Institute of Vienna, what Gen. Derrécagaix declares to be the most complete and most prosperous geographical establishment existing in Europe. The maps of the empire are on three scales: 1:25,000 for branches requiring complete and rigorously exact details; 1:75,000 for the army and the administration; and 1:200,000 for general purposes. All these, in addition, have been subjected, since 1885, to a process of revision.

The Belgian map is on three scales: 1:20,000, 1:40,000, and 1:160,000, and these undergo constant revision. In addition, Belgium issues geological maps.

Denmark was the first to make official use of contour lines for representing the relief. The scales are three: 1:20.000, 1:40,000 and 1:80,000; this last for the general map of Denmark and Schleswig. A new map on a scale of 1:100,000 was begun in 1890. Gen. Derrécagaix finds that the Danish maps require a too constant use of the magnifying glass.

The Spanish map was begun very late. The first sheet appeared in 1874, and fifteen years later the whole number published was 64.

The scale is 1:25,000. The complete map will consist of 1080 sheets; 110 are finished, for the centre of the kingdom (Madrid, Toledo, Ciudad Real, and Cordova).

Gen. Derrécagaix remarks that there is no general map of Great Britain and Ireland. There is a map of Scotland, a map of Ireland, a map of England, a map of each county, sometimes even one of each parish, and these cannot be brought into unison. There are many scales, varying from 1:528 to 1:633,000. The altitudes are taken from the mean level of the sea at Liverpool; but this does not apply to Ireland. The work of the Ordnance Survey includes:

One-inch scale (1:63,360) England 110 sheets, old series, 360 sheets, new series, two editions; Scotland 131 sheets and Ireland 205 sheets, also in two editions.

Six-inch scale (1:10,560) England 1700 sheets engraved, 7,748 photozincographed, each sheet in two editions; Scotland 2,063 sheets, in two editions; Ireland, Dublin County.

There are also 480 town maps, on different scales. Taken as a whole, the work of the Ordnance Survey is most remarkable; but there are details to be changed, and the lack of unity is to be regretted.

The Italian map is the production of the Geographical Institute, founded at Florence in 1873. Its publications are: sheets on a scale of 1:25,000 and 1:50,000; and

The topographical map on a scale of 1:100,000 in 277 sheets. Of these there remained to publish at the beginning of 1899, 17 sheets for the Peninsula and the whole of Sardinia. Between 1889 and 1893 the Florence Institute published an excellent map in 35 sheets on a scale of 1:500,000.

The Netherlands Topographical Institute has brought out, since 1868: The topographic and military map on a scale of 1:50,000; The hydrographic map of the *Waterstaad;* The chromotopographic, or *Strookkaart*, on a scale of 1:25,000; the *Rivierkaart* on a scale of 1:10,000; and three chorographical maps (one geological) on a scale of 1:200,000. These are all excellent maps; and special mention must be made of the Dutch maps of the colonies.

The Portuguese map is on a scale of 1:100,000, and is completed. There are also sheets on a scale of 1:50,000, and a general map on 1:500,000, and reproductions of this on 1:100,000 are issued.

In Roumania the Geographical Institute of Bucharest has finished a map of the Dobruja on a scale of 1:200,000, and is engaged upon: a map of Roumania on 1:50,000; another on 1:100,000; a general map on a scale of 1:200,000; a fluviometric map on

1:100,000; and a forest map on 1:200,000. A general map on a scale of 1:600,000 was exhibited in Paris in 1900. All these maps, based upon French methods, approach the Austrian in style of execution and constitute a fine national work.

The Russian maps, like the English, present a great variety of scales. The linear measure understood in the statement of the scales is the inch: thus a half verst means one inch, etc.

The most important cartographical document is composed of two maps:

1°—The Topographical map of Russia in Europe on a scale of 3 versts, 1/126,000, to comprise 1,031 sheets (972 for Russia, 59 for Poland). About 512 sheets had been published in 1900;

2°—The special map of European Russia, on a scale of 10 versts, 1/420,000. This numbers 154 sheets;

3°—The map of the Caucasus at 1/420,000;

4°—Another map of the Caucasus at 1/210,000;

5°—A map of Western Siberia at 1/420,000.

Russia possesses also:

The map of the Government of Moscow at 1/84,000, in 40 sheets; Turkey in Europe, map at 1/420,000; Turkey in Asia, at 1/840,000; the Military Districts of Turkestan at 1/1,680,000 and 1/840,000; the map known as that of the Frontier Zone of the Russian Empire, in 37 sheets at 1/1,680,000, reaching from the Caspian to the Pacific; and maps, known as those of the Governments, at 1/210,000.

The systems of projection vary in these maps, and they are measured from different meridians. They are based upon an exact triangulation and geodetic work which has acquired, under the impulse of Struve, a special value. One of the most remarkable operations performed is the measurement of the meridian arc of 25° 20′, from the Frozen Ocean to the Danube.

The principal work of reproduction is on the map at 1/420,000, which covers more than half of Europe. It is engraved on copper, and is brought well up to date. The latest publications show a real progress, notably in chromolithography, and the Russian photographic performance tends to an equality with that of the Vienna Institute.

Servia possesses a map on a scale of 1/75,000, reproduced by zincography and in several colours.

Sweden and Norway maintain complete uniformity in their maps, which are on a scale of 1/100,000 and 1/200,000, besides geological and other general and special maps. The triangulation, which has been finished and revised, is more complete in the south than in

other parts. In the Swedish map at 1/100,000 the roads are well treated, and the relief in rocky districts is shown by horizontal hachures. The map of Central and Southern Norway, also at 1/100,000, is to include 216 sheets. It is not equal to the Swedish map in execution. The maps at 1/200,000, published by the two countries, are engraved on copper and on stone.

The Swiss map is magnificent. The triangulation of Switzerland, interrupted by the events of the French Revolution, was afterwards resumed and finished for the level country in 1820. The Alps followed. In 1832 surveys were begun for a map on a scale of 1/100,000; the atlas known by the name of Col. Dufour, who directed the work. It has been frequently republished. A special map of the canton of Geneva, on a scale of 1/12,500, was finished in 1864.

The most remarkable cartographic work of the country is the topographical atlas, composed of 590 maps on a scale of 1/25,000 and 1/50,000, of which 572 have been published since 1879. The map is perfectly clear and of a scrupulous exactitude.

The characteristics of the Swiss maps are precision in the geodetic structure and the representation of the terrain, the lucidity of all the parts and remarkable artistic execution. They constitute a work of great value which has placed Switzerland, in matters of cartography, at the head of the European nations.

Turkey has undertaken in recent years and brought out in 1897 a map of the environs of Constantinople on a scale of 1/100,000 and one of Thessaly and Epirus on a scale of 1/300,000.

Gen. Derrécagaix concludes his survey with a brief history of the cartography of France from the time of Cassini de Thury, whose great map, on a scale of 1/86,400, was almost finished in 1789. It formed the basis of two others: the map of Louis Capitaine, on a scale of 1/345,600, the first to give the Departments, Arrondissements, and Cantons; and the map *du Génie militaire*, on a scale of 1/864,000.

There follows a list of maps, finished and unfinished, ordered by Napoleon, and his plan for a new map of France, out of which grew the present map of the General Staff (*Carte de l'Etat-Major*). From this have been produced by the Ministry of War fourteen other styles of maps, on scales ranging from 1/20,000 to 1/800,000, an admirable topographical map of Algeria, on a scale of 1/50,000, others of Tunisia and Algeria, Madagascar, Africa, etc. To these must be added the maps published by the Ministries of Commerce,

of the Colonies, of Agriculture, of Public Works, of Marine, the Administration of the Forests, the Cadastral authorities, etc.

The number and the variety of these sources amount to a demonstration that the fundamental topographical map does not supply the documents needed for the public service, and a Central Commission, charged with the study of the question in 1898, has settled upon the style and the details of a new map of France, and these have met with the entire approval of the Academy of Sciences.

BULLETIN

OF THE

AMERICAN GEOGRAPHICAL SOCIETY.

Vol. XXXIII **1901.** **No. 4**

TOPOGRAPHIC FORMS OF THE UNITED STATES.

BY

HERBERT M. WILSON.

During the past quarter of a century the topographic branch of the United States Geological Survey has been actively engaged in making a detailed map of the United States. In this time it has surveyed 872,000 square miles, or nearly 30 per cent. of the area of the country, and the results have been published on about 800 separate atlas sheets. These are about 13 by 17 inches in dimensions, and each represents from 225 to 900 square miles, according to its scale. This work has now progressed to the point where typical portions of the varied topographic features of the United States have been mapped, and from an inspection of them we may gain an insight into the physiography of our continent.

A study of the country with these maps in hand creates a new interest in the natural features which surround us. It is one thing to look at a beautiful flower; it is quite another to dissect it and to analyze and discover the framework which gives it form and permits its classification. In the same way a new interest is developed in the examination of the scenery of a region, when its topography has been interpreted and classified in the light of an analysis of the underlying rocks which give it form. Especially is this true for the teacher, who gains thus an experience which gives his subject a vividness to be gained in no other school.

The mapping has so far been prosecuted chiefly in those portions of the United States in which economic minerals and rocks may be sought. This includes the mountains of New England and the Appalachian Mountains of the Middle and Southern States; portions of Michigan, Arkansas, and Texas; and the areas in which

silver and gold and their associated metals are found in the Far West. Also, some special areas in which particular investigation has been made regarding the value of lands for agricultural purposes; or as producers of forests; or in connection with the development of irrigation. From these initial regions the mapping is now being extended into all portions of the United States.

The essential feature of these maps is that which represents topographic form, or, as it is more commonly called, the surface relief. This is by lines of equal elevation called "contour lines." These express uniform differences of elevation in terms of their horizontal projection on a map surface. Consequently, the distances between them in plan give the slopes and grades of the surface forms. The base to which these differences of height are referred is the mean level of the sea. The shore-line marked by the ocean is the zero of elevation, or the zero contour line. If the contour interval is, for example, 50 feet, you may imagine the height of the surface of the ocean raised by that amount and its shore-line re-mapped. This line will be the 50 feet contour line, every point upon it having that elevation above the level of the sea. If now the sea were raised 50, 100, and 150 feet, etc., and its successive shore-lines mapped, the result would be a topographic map having a contour interval of 50 feet. By observing the horizontal distance apart of these contour lines, an idea of the steepness of the various slopes is obtained. Thus if two 50-foot contour intervals occur in a mile horizontally, the slope is 100 feet to the mile. If the same number occur in a quarter of a mile horizontally, the slope is four times as steep, or 100 feet in a quarter of a mile, etc.

The various topographic forms found on the surface of the earth have been aptly described as "expressing geologic structure, much as the outlines of the human body express anatomical structure." Accepting this as true, it is obvious that the classification and interpretation of such forms require a knowledge of the origin of the rock structure underlying a given region and the agencies which have acted upon its surface. The processes which have produced the various topographic forms are called physiographic, and physiography has been well defined as "a description of the surface features of the earth." Accordingly, the study of physiography includes an explanation of the origin of topographic features.

Physiographic processes may be divided into two great classes, according as they have been produced by agencies which are constructive or destructive. An example of the former is a volcanic cone built of ejecta from the vent of a volcano. An example of the

latter is to be found in the cliffs bordering the ocean, which are washed and worn away by wave action.

The constructive agencies which leave the most evident marks upon the surface of the earth in topographic forms are those due—1, to diastrophic action, by which regions sink and rise; 2, to volcanic action; and 3, to deposition, as from water carried in overloaded streams or gravel deposited from glaciers. The more important destructive agencies are—1, Those due to aqueous erosion, as from flowing water; 2, those due to aerial erosion, as wind-borne sand abrasion; 3, those due to corrasion, which is a wave or glacial action; and 4, those due to disintegration resulting from frost, chemical action, etc. Aqueous agencies are those chiefly potent in shaping topographic forms. The effects of these are so commonly seen as to have gained them the name of regular forms, while those forms resulting from other agencies have been called irregular.

The massive features produced by the great constructive and destructive agencies are finally eroded into the more familiar topographic forms with which we are acquainted. This modelling takes various forms, due—1, To the character and hardness of the rock; 2, to the geologic structure or position of bed-rock; 3, to the slope of the surface; 4, to climatic conditions; 5, to accidents during development; and 6, to the length of time during which the eroding agencies have acted.

Among the more important constructional forms due to the action of diastrophism and illustrated in the topographic maps of the United States are the following:

Emerged plains are illustrated in the coastal plains shown on the Goldsboro, N. J., and Leonardtown, Md., sheets. In the latter case erosion has considerably modified the more level form which the plain had immediately upon emergence; Plateaux are illustrated on the Charleston, W. Va., sheet, Cañon de Chelly, Ariz., and Lamar, Col., sheets. The former have both been highly eroded, while the latter, which is of more recent origin shows less the effects of weathering; Block and massive mountain ranges are illustrated on the Abajo, Utah, and La Plata, Col., sheets; Lake basins and lacustrine plains are illustrated on the Diaster, Nev., and Lassen Peak, Cal., sheets.

Of constructional forms due to the action of volcanism excellent examples are those illustrated in the lava plains of the Bisuka, Idaho, and of the Mt. Taylor, N. Mex., sheets. Also the volcanic cones in the neighbourhood of Mt. Shasta, Cal.

Among the more important gradational forms illustrated in the

topographic maps of the United States, and which are due to the action of water, are the following: Alluvial cones are shown admirably on the Cucamonga, Cal., sheet. Alluvial plains are illustrated on the same sheet and on Fargo, N. Dak., also in the built-up valley lands of the lower Mississippi on the Donaldsonville sheet. Wash plains are shown on the Brackett, Tex., and Camp Mojave, Cal., sheets.

Of the aggradational forms produced by ice excellent examples are some of the following: The drumlins and moraines of central New York shown on the Syracuse sheet; those of Wisconsin on the Sun Prairie and Eagle sheets.

Terminal moraines and glacial plains and drift sheets are shown on the Marion, Ia., sheet.

Gradational forms resulting from wind action are well illustrated in the sand dunes of the Provincetown, Mass., sheet, the Coos Bay, Ore., and Kearney, Nebr., sheets. Those due to action of degradation are well illustrated in the sculptured forms, resulting from the erosive action of water. Examples of these are the dissected plateaux of the Fort Payne, Ala., and Charleston, W. Va., sheets.

Residual forms left after the removal of surrounding materials by erosive action of water are excellently shown in the mesas on the Marsh Pass, Ariz., and East Tavaputs, Utah, sheets. The same are shown in the massive mountain ranges throughout the country, and especially in the monadnocks or massive rocky hills, which, because of their hardness, have been left standing after erosion has removed their surrounding envelopes. An example of the latter is Mt. Monadnock, New Hampshire.

FETISHISM, A GOVERNMENT.

BY

ROBERT HAMILL NASSAU.

In civilisation, under governments other than autocratic, law being made and executed, at least professedly, with the consent of the governed, all enactments find not only their justification, but also the possibility of their enforcement in their support by public opinion. It is the general consensus as to the need of an enactment regarding certain conditions, affecting the lives or happiness or rights of the majority, that crystallises opinions into a form of words and gives authority for the enforcement of the decisions expressed by those words.

This is also partly true even under governments more or less despotic, where the will of the ruler, not of the ruled, is made the basis of law. Few despots are so utterly tyrannical as deliberately to arouse opposition on the part of their subjects. Even a Nero, who would refuse a petition if it happened to run counter to his whim, would grant that same petition if it happened to coincide with his own whim of another day. Even he thought it desirable to pander to the public taste for the butcheries of the amphitheatre, not simply because he himself enjoyed them. Though he could initiate no measure for the real good of Rome, he recognized the necessity of responding to the cry, *panem et circenses*.

In all governments fear is recognized as one of the grounds for the enforcement of law. In even the great nations and under the highest form of civilisation, the public opinion that administers law makes its demand partly in the interest of essential right, partly with the instinct of self-preservation against forces of evil, and partly for the punishment of wrong. Punishment in itself is not reformatory. It is retributive; it is deterrent; it plays upon fear.

In the native African tribal forms of government, while it would not be true to say that there is no justice in the customs they recognize, it is true that the only sentiment appealed to in the enforcement and even in the enactment of supposed needed measures is that of fear. Their religion being one of fear, it is therefore appealed to, to lend its sanction and aid.

Among the negro tribes of the Bight of Benin, and the Bantu of the region of Corisco Island and of the Ogowe River, in what is now

the Congo Français, there was a power known variously as Egbo, Ukuku, and Yasi, which tribes, native chiefs, and headmen of villages invoked as a Court of last Appeal, for the passage of needed laws, or the adjudication of some quarrel which an ordinary family or village council was unable to settle.

In those councils an offender could be proved guilty of a debt, or theft, or other trespass, and when it was no longer possible for him by audacity or mendacity to persist in his assertion of innocence, he would yield to the decision of the great majority against him. But there was no central government to enforce that decision or exact from him restitution. The only authority the native chiefs possessed was based on respect due to age, parental position, or strength of personal character.

If an offender chose to disregard all these considerations an appeal was then made to his superstitious fear.

Egbo, Ukuku, Yasi, was a secret society composed only of men; boys being initiated into it about the age of puberty. Members were bound by a terrible oath and under pain of death to obey any law or command issued by the Spirit under which the Society professed to be organised. The actual, audible utterance of the command was by the voice of one of the members of the Society, chosen as priest for that purpose. This man, secreted in the forest in a clump of bushes on the outskirts of the village, or in one of the rooms of the Council House, disguised his voice, speaking only gutturally. The whole proceeding was an immense fiction. They believed in spirits, in the power of fetish charms, they made such charms as part of the Society's ceremonies; but, as to the decisions, all the members knew that the decision in any case was their own, not a spirit's. They knew that the voice speaking was that of their delegate, not of a spirit. Yet, for any one of them, or for any woman, girl, or uninitiated boy to have said that would have been death. And those men who would not have submitted to that same decision if arrived at in open council of those same men as *men*, and known before the whole village to be speaking only as men, would instantly submit when once the case had been taken to Ukuku's Court. They carried out that fiction all their lives. Let a man order his wives and other slaves to clear the overgrown village paths, they might hesitate to obey by inventing some excuse that they were too much occupied with other work, or that they would do it only when other people, who also used the same path, should assist. Or, if under the sting of a *kasa-nguvu* (lash of hippopotamus hide or manatus skin), they started to do the work, they might do it only partly or

very unsatisfactorily. But let that same man call in the other men of the village, and summon a meeting of the Society, those same women would submit instantly and in terror of Ukuku's voice. Much as they may possibly have suspected it was a human voice, they did not dare whisper that suspicion. Themselves helped to carry on a gigantic lie. They taught their little children, both girls and boys, that that voice belonged to a spirit which ate people who disobeyed him. When the Society walked in procession to or from their appointed rendezvous they were preceded by runners, who, with a well-organized cry and with kasa-nguvu in hand, warned all on the path of the coming of the Spirit. Women and children hastened to get out of the way, or, if unable to hide in time, they were to avert their faces. The penalty for a woman even seeing the procession was a severe beating (that, however, might be commuted to a fine).

About thirty-seven years ago, in the island of Corisco, the then headquarters of the Corisco Mission, there was a long-standing feud between the Benga tribe, inhabiting that island, and the Kombe tribe, dwelling at the mouth of the Eyo River of the Benita country, fifty miles to the north. Benita was also a part of our mission field. The quarrel between the two tribes greatly obstructed our mission work. Missionaries were entirely safe to travel between the two places, respect being given them as foreigners, and their presence in a boat protected their crews; but it was often difficult to obtain a crew willing to go on that journey without the presence of a white man. The difficulties caused by the feud fell heavily also on the Benga people themselves. The island itself had no products for trade. Ivory, dye-woods, and rubber came from the Benita mainland. Many Kombe women had married Benga men and needed frequently to revisit their own country. Finally, to end the feud, it was agreed that the Kombe Ukuku Society, whose power was held in even greater fear than that of Benga, should come to Corisco and settle the affair.

It was a day of terror at the Girls' Boarding School, of which I was then Superintendent. As the long, blood-curdling yell of the forerunners, on the public path that ran only one hundred feet from the school dwelling, announced the approach of the procession, the girls fled, affrighted, to the darkness of the attic of the house, and subsequently, after the procession had passed, they ran away secretly in byways to their own villages, feeling safer in the darkness of their mothers' huts than in the mission house; for it had been reported that Ukuku, besides settling the tribal feud, intended to attack the mission work that had been successfully making converts

among the Kombe, because any native who became a Christian immediately withdrew from membership in the Society. It had, therefore, begun to feel a little anxious about its safety. I stood at my door and saw the procession pass. They saw me, but because of my sex they did not show any displeasure. They were painted with white and other coloured chalks that gave a horrible expression to their faces; their look was defiant; and a hoarse, muttered chant had, even on myself, a depressing effect. I could well imagine that to a superstitious native mind the *tout ensemble* would be terrifying.

The procession on its way chose to pass over a road that had by use become somewhat public, but which was owned by the Mission, and it was only fifty feet distant past the front door of the house of the senior missionary, the Rev. James L. Mackey. Mrs. Mackey was standing at the door of the house. Not being a Benga woman, she saw no reason why she should retire before Ukuku, and she did not. Ukuku went to their rendezvous in a rage, and the Kombe portion demanded the life of the woman who not only had not hidden her face in their presence, but had dared persistently to look upon them. This demand was modified by the Benga portion to a fine; whipping, not even they daring to suggest for a white lady. That demand for a fine was actually brought to Mr. Mackey, who gave a dignified reply, pointing out (1) that, as foreigners, white people were not subject to Ukuku; (2) that Ukuku had trespassed on Mission private property, and was itself responsible for being seen; (3) that, as a Christian, in no case could he recognize the authority of Ukuku to order or fine him. In reply, Ukuku made the point that they were the government of the country, and that even foreigners were bound to obey law. (Corisco actually belonged to Spain, but Spain in no way exercised any visible authority whatever over it.)

They admitted their trespass on private property, but still demanded the fine. Mr. Mackey made no further reply; and, of course, as a matter of conscience, refused to pay the fine. But it transpired afterwards that native friends, fearful lest matters should come to an ugly pass through his refusal, privately paid the fine themselves. The missionary, unaware of this, thought he had triumphed. Really, Ukuku had; but not unqualifiedly, for it was a shock to his power that it should have been disputed at all, even by a white man.

About the same time a young slave man, who was beginning to attend church with desire to become a Christian, was sitting in a village where was being held a meeting of the local Ukuku Society.

The object of the meeting was to alarm and drive back to a more constant performance of fetish observances some of the villages on which heathenism was beginning to lose its hold. In the course of his oracular deliverances the Ukuku priest mentioned by name this young man. In his fresh zeal as a convert he made a protest. Perhaps duty did not call for even that just at that time. But he even went beyond. As he was able to recognize the voice, though disguised, and knew who the owner of the voice was, he made a fatal mistake in saying, "You, such-a-one, I know who you are. You are only a man. Why are you troubling about me?" He was promptly dragged to the seaside and was decapitated.

While converts felt the propriety of abandoning their membership in the Society and any participation in its ceremonies, the Mission had not required of them nor deemed it desirable that they should make a revelation of its secrets.

But it had occurred in the early history of the Mission that one young man, Ibia, a freeman, member of a prominent family, had felt that in breaking away from heathenism and becoming a Christian he should cast off the very semblance of any connection with or even tacit endorsement of evil. He knew the Society was based on a great falsehood. As a lad he had believed Ukuku was a spirit. On his initiation he had found that this was not so. But, loyal to his heathenism and to his oath, he had assented to the lie and had assisted in propagating it. He was known for the fearlessness of his convictions, and in his conversion he, to a rare degree, emerged from all superstitious beliefs. Few emerge so utterly as he. He, therefore, publicly began to reveal the ceremonies practiced in the Ukuku meetings. At once his life was in danger. The two pioneer missionaries, Rev. Messrs. Mackey and Clemens, were men of exceptional strength of character and wise judgment, and had obtained a very strong hold on the respect and affection even of the heathen. Their influence, united with a small party of Ibia's own family and a few of the more civilized chiefs, was able to save his life; he being guarded in the mission-house until the fierceness of heathen rage should abate. But, though his enemies presently ceased from open efforts to kill him by force, they proclaimed that they would kill him by means of the very witchcraft power he was despising. They said they would concoct fetish charms which would destroy the life of his child, and that they would curse the ground on which he trod so that it should sicken his feet. Not long afterwards his infant child did die; and one of his feet for more than a year had a painful ulcer. The coincidence was startling, and somewhat tri-

umphant for the heathen. But infant mortality is large even among natives; and phagedenic ulcers of the leg are very common. Ibia recognized his afflictions as a trial of his faith permitted by God. He came out of his fiery trial strong, and his life since has been that of a reformer, uncompromising with any evil, earning from his own people their ill-will by his scathing denunciations of anything that savours of superstition. He is now the Rev. Ibia j Ikenge, member of Corisco Presbytery, and pastor of the Corisco Church. And Ukuku has long since ceased to exist on the island.

Like all government intended for the benefit and protection of the governed, Ukuku, when it happened to throw its power on the side of right, was occasionally an apparent blessing. It could end tribal quarrels and proclaim and enforce peace where no individual chief or king would have been able to accomplish that same result.

On one occasion the Rev. William Clemens took a young Benga man to locate him as evangelist in the bounds of a mainland heathen tribe, where there was some doubt as to the young man's safety. The village chief, though a heathen and entirely uninterested in the religious aspect of the case, was alive to the fact that the presence among his people of this young protégé of the white man would increase his tribal importance, and that his people themselves would derive a pecuniary benefit from even the small amount of money that would be spent on the evangelist's food. He therefore voluntarily offered to call an Ukuku meeting and have a law enacted that no one should machinate against the Benga's life by fetishes of any kind. Mr. Clemens declined the offer. If he accepted Ukuku's authority to defend him he might some day be called on to submit to that same power as an authority to punish him. He wisely avoided an entangling alliance. He told the chief that he preferred to entrust his protégé to his care and to rely on his promise rather than on Ukuku's. This compliment put the chief on his mettle; the evangelist's protection became to him a case of *noblesse oblige.*

The power of this Society was often used as a boycott to compel white traders as to the prices of their goods, using intimidation and violence after the manner of trades unions in civilized countries. This was true all along the west coast of Africa wherever no white government had been established. It ceased at Libreville, in the Gaboon country, after the establishment of a French colony in 1843, with a white governor, a squad of soldiers, police, and a gunboat. Also at such trade centres as Libreville, Ukuku early lost its position, for the population was too heterogeneous and there were too

many diverse interests. At the trading-houses were gathered native clerks and a large staff of servants as cooks, personal attendants, boatmen, etc., representing a score of tribes from distant parts of the coast. Whatever obedience they gave to similar societies in their tribes they did not feel bound by the local one, to which they were strangers; and they were disposed under a community of trade interests with their employers to disregard the society of the local tribe, to whom many of them felt themselves socially superior.

But at Batanga, in what is now the Kamerun Colony of the German Government, the Ukuku Society forty years ago carried itself with a high hand. Batanga was not then claimed by any European nation. Its trade in ivory was one of the richest on the west coast of Africa; so rich that the Batanga people became arrogant. Some of them despised to make plantations of native food supply, and lived almost entirely on foreign imported provisions, taking in exchange for their abundant ivory, barrels of beef and bags of rice and boxes of ship's biscuit. It was a case of demand and supply. The native got what he wanted in goods, and the white man obtained the precious ivory. But, in the competitions of trade, fluctuations in the market, and the growing demand of the natives for a higher price, there came days when some white man, seeing the margin of his per cent. or gain becoming too narrow, would refuse the current price. Doubtless, often the white men were arbitrary, not only in prices but in other things also. Doubtless, also, the natives were often exorbitant in their demands. When the differences became extreme the native chiefs called in the aid of Ukuku. The phrase was to "put Ukuku" on the white man's house. The trader was boycotted. He stood as under a major excommunication. No one should buy from or sell to him. No one should work for him. He was deserted by cook, steward, washerman, and all other personal attendants. Sentinels stood on guard to prevent food being brought to him or even to prevent him lighting a fire in his own kitchen if he should attempt to cook for himself.

The white trader generally succeeded in breaking down the interdict put upon him by three several means, viz.: (1) He had in his house a supply of canned goods and ship's biscuit, with which he would not starve. (2) His negro mistress almost always remained faithfully with him, secretly assisting him, divulging to him the plans of her own people—as in the history of Cortes and the conquest of Mexico. She dared to do this, being tacitly upheld by her own family. The position of "wife" to a white man was considered by the natives as an honourable one, and was sought by parents for their

daughters. It was an exceptional source of wealth for them. (3) If other means failed, the trader could almost always break the boycott by bribes of rum. Time was money to him. Often, indeed, in a malarial country, it was life to him. Though time was worth nothing to the native, the rum he had learned to love became a necessity to him. In cutting the white man from their ivory they had cut themselves from that white man's rum. A judicious expenditure of demijohns, in proper quarters, generally enabled Ukuku to revoke his own law. Then, perhaps, the white man would make some slight concession.

I had an experience of this kind in the Benita country in 1868. I had been there several years. There was growth in the desire for the good things that money can buy, but wages and prices had remained unchanged. I was obtaining all I needed of both labour and food without difficulty. Had I any difficulty I should, naturally, have offered more inducement. I was not aware that there was any discontent. None of my employees had asked for a rise, nor had people, in selling their vegetables, etc., complained of the price I gave.

Suddenly, one morning, a company of about twenty men, led by an ambitious heathen, whose manner had always been dictatorial to me, and to whom I had shown no favour, filed into the public meeting-room of our mission-house. I knew them all; none were in my employ, nor were any of them Christians. As if they thought it was hopeless to attempt to obtain anything from me by petition or respectful request, they seemed to have decided to stake all on a demand and threat. They suddenly and harshly began, "We've come to order you to change prices." Naturally, I felt nettled, and replied that I saw no reason why I should take orders from them. They rose in a rage and said, "Then we'll put Ukuku on you—(1) No one shall work for you. (2) No one shall sell you food or drink. (3) You shall not go yourself to your spring." And, with a savage yell, they left the house. Instantly, a great terror fell on the native members of my household. Those who were heathen dropped work and went to their villages. Those who were Christians came to me distressed, saying that they desired to obey me, but they feared the interdict. I relieved for them the situation by excusing them from farther work "'till I should call them." And I refrained from ringing the call-bell at the usual work hour.

With me were Mrs. Nassau, our child's nurse, my sister, Miss J. A. Nassau, and two native girls, members of another tribe. Nurse was a foreigner, a Christian Liberian woman, who was not amenable to

the interdict. Some of my Christian employees, though not working, remained on the premises. A few visitors came in the afternoon to sympathize; some in sincerity, some to see how we were feeling, and some as spies to see what we were doing. The interdict, except as an expression of ill-will, and a possible check to my mission work, did not trouble me. As to food, I had an ample supply of canned provisions, sufficient for a long siege. In refusing to sell me of their native products the people would miss more than I should. As to work, the cleaning of the premises was not pressing, and could safely be neglected. As to drinking-water, enough could be caught from the roof in the almost daily rains. Food and labour were their own, to refuse if they chose to. But the spring was on my premises, and belonged to me. Refraining from going to it might be deemed cowardice; at least, it would be obeying an order of what Ukuku claimed was a spirit. An order from men I might submit to under compulsion; to submit to this spirit went against my conscience. After prayer and consideration overnight, Mrs. Nassau fully agreed with me that it was right I should make a demonstration at the spring. In parting with her next morning, as I took up a bucket to go to the spring, she knew I might not return alive. A sandy path led through low bushes to the spring, several hundred yards distant. I saw no one on the way nor at the spring. I filled the bucket and was turning homewards, when a spy, armed with a spear, jumped out of his ambush and ordered me to leave the water. As I did not do so, but started to walk over the path, he stabbed at my back. I thrust the spear aside and faced him, but walking backwards all the time. He feared my eye, and did not attempt to stab me in front, but tried to spill the water in the bucket and stab from behind me. But the bucket, and its contents, I guarded as he struck at it from right to left, by rapidly changing it from left to right with one hand and warding off the spear with the other; still walking backwards, and keeping my eye on him, the bucket and I reached the house in safety.

He hastened to the native villages, whence soon I heard a great outcry. A company of Christian natives came in haste, saying that Ukuku was on his way to assault the house, and that they, and other young men, even some who were not Christians, would fight for me against their heathen parents, if I could provide them powder. I supplied them. Then they bade me hasten fasten all doors and windows.

The Mission dwelling consisted of two houses joined by a covered veranda; one, a one-storied bamboo, the other framed of

boards, one and a half story. Mrs. Nassau was in the latter, closing it. Before I had finished closing the former the enemies came, and I was alone in the bamboo house. Shots rattled against the walls. Through the chinks I could see the young men were guarding all entrances, and were firing. I think that, in this difficult situation, defending me against their own people, they purposely fired wide, for no one was even wounded. But their standing armed checked the enemies, who then soon retired. In after years these were ashamed of their assault, and tried to minimize it when it was related to new missionaries by representing that they did not intend to kill me. I accepted that as a kindly afterthought. Certainly, that spy at the spring did intend, and tried hard, to kill me. Certainly, also, their gunshots left their marks on the walls of that bamboo house, and, for aught they knew, had penetrated the thin walls, and might have struck me.

That their interdict had been successfully broken, and that, too, by the aid of their own sons, was a great blow to the Ukuku party. It was the beginning of the end of its power. Four years later, while I was absent on my furlough, the number of the church members having largely increased, two young men, themselves of strong character, and imbued with the courage of my able successor at Benita, deliberately determined to "reveal Ukuku." They walked through a village street openly shouting to the women that "Ukuku is only a man." At once their lives were demanded; but so many of their companions stood up for them, and said to their own fathers, "The day you kill those two you will have to kill all of us, for we all say also that Ukuku is only a person." Nevertheless the Society met. But when the members looked in each other's faces, each one knew that in voting to put to death the other men's sons he was voting also against his own son. The Society could have dared to kill one or two. But to kill a score! They shrank from it. Everyone thought of his own son thus involved, and the great lie was exposed, and died.

In 1879, on the Ogowe River, at my interior station, Kangeve, near the town of Lambaréné, 130 miles up the course of the river, I had a similar experience with that same Society, known there in the Galwa tribe by the name of Yasi.

In my new work on the Ogowe I pursued toward that Society the same course I had followed with Ukuku at Benita. I preached simply the Gospel of Christ. But it is true that the Gospel touches mankind in all their human relations. I, therefore, was not silent about such sins as slavery and polygamy, any more than I would be

silent about the sins of drunkenness or theft. All these were practices the evil of which, in serious moments, most natives would admit, however much they chose still to persist in them. But witchcraft was their religion; they believed in it. To attack it openly would only offend, and I would lose the personal influence which I was able to exercise in quiet, private discussions. Yasi, though a falsehood, was their government. To attack it would have simply emptied my church of every heathen auditor, and to have debarred any women or children being allowed to receive further instruction. I could wait, bide my time, for the entering wedge of Christian principles to overthrow what I could never have removed by direct onslaught. In conversations with my heathen friends, the native chiefs, in their own houses, when no women or children happened to be present, I would expostulate with them against such a mode of government. I told them I would render them respect and even obedience if, as persons, they should enact laws affecting me as a person, but that I could give neither respect nor obedience to what they knew I knew was a lie. They looked troubled, and replied, "Yes, that's so, but don't tell it to the women." And I did not. Nevertheless, in my untrammelled conversations in the mission-house with my own Christian male employees I was not careful to be silent if our schoolboys happened to be present. And these same employees, in their own dormitories, deliberately and intentionally told the boys of the falsities of their tribal superstitions. They were right. This was Christian principle, working as I desired it should. Inevitably there grew up a generation of lads who began to deride Yasi, and said that they would never join the Society.

There came one day a delegation of them, led by two Christian young men, Mamba and Nguva, asking my permission to play a mock Yasi meeting. I asked them, "Will you dare to play that same play in your own villages?" "No, we would be afraid." "Then don't do here what you are unable to carry out elsewhere. I cannot defend you in your own villages. You are safe here. Wait until you are stronger and more numerous. Just now your play will create confusion." Nevertheless, they did play, with the result of which I had forewarned them. The chiefs were enraged. They "put Yasi" on my house, which meant that I was not to be visited nor sold any food. There was a report, also, that the mission premises were to be assaulted with guns. The loss of food supply was a serious difficulty. I did not need any for myself and sister, nor for the two young missionaries, both of them laymen, who were

visiting me from a sea-coast station, and who could not understand the case in all its aspects, for they had never met with the Society's power; it did not exist at their station, having been broken before they had come to Africa. But how was I to feed thirty hungry schoolboys? I had to send most of them away to their distant homes; down the river; and my canoes returned with a temporary food supply, that they had been able to buy at places on the route where news of the interdict had not as yet been officially carried.

The dozen young men who remained with me I armed with guns obtained from a neighbouring trading-house, and I posted sentinels every night to guard against sudden assault. I went to the native villages and met a council of several of the chiefs. They seemed desirous to keep on friendly terms with myself, but they were angry at their own children. But they took me to task for my warlike preparations. These I told them were for defence; that I would use the guns only when they compelled me to do so. Then they complained that I had taught their children to disobey them; that one of the greatest of God's commands, which I had taught them, was to honour their parents. I said that the Father in Heaven claimed priority even to an earthly parent; and how could children really honour parents who were persistently deceiving them about Yasi, who they knew was only a person? They winced, and looking towards some women who were passing by, said, "Don't speak so loud; the women will hear you." They made another complaint, viz., that I was trying to change their customs; I could keep my white customs, and they would keep theirs. I frankly told them that I would be pleased to see some of the customs changed which were evil, but that neither I nor any other missionary could compel them to change; nevertheless, these customs would be changed in their and my own lifetime. They were terribly aroused and swore, "Never! Never! You can't change them." "No, not I, but they will be changed." "Never! Who can or will do it?" "Your own sons." "Then we will kill our own sons."

They seemed to transfer their anger against me to their own children. The interdict against my house was not formally removed, but it was not enforced. I no longer felt it necessary to post sentinels at night. And secretly—at night—a sister of these very chiefs sold me food for my family. But the heathen rage spread down the river to the villages of the disbanded school children and native Christians. One of these, Nguva, was seized, chained, and offered to Yasi "to be eaten." He was rescued by a daring expedition made by my two lay missionary visitors, who

went in my six-oared gig with my twelve enthusiastic young native Christian workmen. They went fifteen miles down river; were secretly directed by one of the little schoolboys to the village where Nguva was chained in stocks, assaulted the village at the mid-afternoon hour, when all the men were away, cut Nguva from the stocks, and brought him in triumph to my house. But in the retreat up the river they had for a distance of five miles been subjected to a fusillade of guns from both sides of the river. The river was wide, and they kept in midstream, and no one was injured. But the consequences of that resort to arms made me much trouble after my visitors had safely returned to their seaside station. According to native law I, and not my guests, was held as the responsible party, and it was not satisfactorily settled until some months afterward.

My prophecy came true; less than ten years later little children were playing Yasi as amusement in the village streets. Nguva became an elder in the church. He is now dead. His chain is a trophy in the Foreign Board's Museum, 156 Fifth Ave., New York City.

BATANGA, WEST AFRICA.

THE SOLUTION OF THE PROBLEM OF THE TIDAL BORE.

BY

ALEXANDER BROWNLIE.

The marine phenomenon, the tidal bore, is a sight so very rare to the vast majority of people that, comparatively speaking, it is practically unknown; and yet its appearance is so very extraordinary that, were it known, it would be considered by every lover of nature an object well worth going a long distance to see. It occurs only in a very few rivers, and even in these few it does not always present itself at the time when it is expected. Sometimes it fails to appear—as in the case of the Severn and of the Solway, in Great Britain.

Prof. Geo. H. Darwin noted the fact of the failure in the Severn in "The Tides," and the writer observed the failure in the Solway. In the latter case there was no bore proper; instead there was only a small ripple—so very small, indeed, that an observer upon the shore failed to notice it; but from an upper window its upward progress was barely discernible upon the still, glassy surface of the firth. In a few rivers, however, the bore is permanent, and in two of these it attains very remarkable proportions—that is, in the Tsien-Tang, China; and in the Petitcodiac, New Brunswick, Canada. The former is by far the greater of the two, and is a veritable world-wonder.

Notwithstanding the rarity of this remarkable phenomenon, very little notice has been taken of it by scientists—so far as we are aware—and still less done towards the solution of it; and that little, so far as solving the problem is concerned, seems not only very unsatisfactory, but in some cases very unscientific. For example:

Prof. Arnold Guyot said that, "The bore is due to a struggle between the ascending wave and the opposing current of the stream." Were that theory correct, then bores would occur in every tidal river on earth, for every river current would create one!

Prof. Geo. H. Darwin made several statements with a view to the solution of the problem.

1. In one of his announcements he claimed that:

> It is due to the concentration of energy in a narrow space: when an estuary contracts, the range of tide is magnified.

In answer, it may be said that all estuaries become contracted,

but very few indeed produce the bore. Nor is it true always that tides rise to their highest in contracted places. For instance, they rise much higher in the broad Firth of Clyde than in the contracted strait of the North Channel. "The energy of motion in the narrower space" of the North Channel fails totally to produce magnified tides, because the rise there is exceedingly small; whereas, on the contrary, the magnified tides take place in the wider Firth and in the widest part of its co-tidal basin, the Irish Sea. Yet, it is true that the power abiding in "the energy of motion in a narrow space," when brought into union with the precise conditions which cause the bore, is one of the attending conditions, but only one, and of itself, when standing alone, is utterly helpless.

2. In Mr. Darwin's second announcement he said:

> It would be impossible from the mere inspection of an estuary to say whether there would be a bore there; we could only say that the situation looked promising or the reverse. The capriciousness of the appearance of the bore proves that it depends on a very nice balance between conflicting forces, and the irregularity in depth and form of estuary renders the exact calculation of the form of the rising tide an impossibility. It would be easy to imitate the bore experimentally on a small scale, but we must rest satisfied with a general comprehension of the causes which produce it.

But he himself did not continue to "rest satisfied with a general comprehension of the causes," for afterwards he announced his third, and final, statement—a statement, by the way, of a decidedly revolutionary character compared with the first two and a total departure from the orderly methods of science:

> 3. Whence does this energy come [the energy of the bore]? Now, I say that it comes from the rotation of the earth.

The Tides.

His third attempt to solve the problem comes to us as a great surprise; and, strangely enough, it stands without the support of a single reason, or of an observed fact, to prove it, in "The Tides;" therefore it is merely a personal opinion, and nothing more. But that is not science. Yet, coming from such an authority, we pause to think how the new solvent will act. Were we to concede that the third statement is the correct theory, then we must confess that the rotating earth is able to carry everything along with it from west to east, except the Chinese bore! That it carries onwards the banks and the bottom of the river, and even the atmosphere above it, but not its flood tide! That, somehow or other (no reason given), the flood tide is left behind! It is also quite clear that the

ebb tide is not affected by rotation; it is only the flood tide that is operated by it! Such a singular doctrine seems as if it had been conceived and brought forth in order to explain the *westerly* rush of the Chinese bore. But, as geographical students, we must not ignore the fact that the Canadian bore begins its rush in a *northerly* direction. In like manner, so does the Indian bore of the Hugli. The British bores in the Severn and the Solway travel *easterly*, and the French bore in the Seine travels *southerly*. In fact, to us, tidal bores are known to travel all round the compass; therefore, rotation does not enter into the problem at all. It is all a mistake.

The Bore of the Petitcodiac.

The bore of the Petitcodiac may be seen from one of the wharves of the town of Moncton. When one is perched upon one of these, as upon stilts, more than thirty feet above the bed of the river, towards the time of local low tide, the ebb seems to spend an unusually long time in taking its flight to the sea. In fact, it continues to flow seawards for the extraordinary space of nine hours, and at times even for nine and a half hours; but towards the expiry of that limit the broad river—nearly half a mile wide—becomes an empty river, with its shoals and flats everywhere in sight exposed to view; and in the lowest level there trickles a stream, only a few inches deep. Hence from such a puny rill, as compared with the swift, violent, inflowing tide, one does not get the faintest impression that a struggle between the two is possible.

Nor is it possible. Prof. Guyot, evidently, had never stood on the wharves at Moncton!

Nor is there any capriciousness in the appearance of the bore. It never fails to come. Sometimes the bore-breaker may have a frontal height of five feet, and again its height may be only three feet; but *it* is never capricious in the matter of its coming. When Prof. Darwin made his statement about the capriciousness of bores, evidently he, too, had never been an observer at Moncton!

The tidal bore is absolutely unlike an ordinary tide. It comes suddenly with a rush and a roar. It looks as if the sea had broken loose from its bounds. It can be seen and heard a mile away. Its bellowing, seething mass fills the whole breadth of the channel of the river. Its breaker falls with a crash like a breaker of the sea, for it travels very fast. At Moncton the rate of speed is 8.47 miles an hour—a very high rate for water. But it is not merely a breaker—a detached wave—like a breaker of the sea. It is the front of an inclined plane that rises higher and higher

towards the sea! This is the feature that gives the impression that the sea has broken its bounds. Around the wharves the muddy waters surge and rapidly rise; sometimes the rise may be nine feet in seventeen minutes; at others it may take half an hour to make the same rise, but in any case the whole river is alive with the rushing flood, and soon is brimming full from bank to bank, thirty feet deep, and that in the extraordinarily short space of from three to three and a half hours. In other words, there has been an actual rise of forty-two feet above low-water level at the entrance of the river into the Bay of Fundy.

In our observation of the bore of the Petitcodiac we discern two abnormal local tidal conditions—1, The ebb is exceedingly long and slow; 2, the flood is exceedingly short and swift. These conditions are totally different from the usual tidal conditions of the Atlantic Ocean, therefore wholly local; but both are necessary towards the formation of the bore.

But still further, in connection with the abnormal local tidal conditions at Moncton, we must remember that tides are REGULAR at the entrance of the river. Hence, when tide is low at Moncton, it is half-tide at the entrance of the river—that is, it has risen twenty-one feet there. The river-bed at Moncton lies twelve feet above low-water level at the entrance of the river; hence, at half-tide, the level at the entrance of the river stands nine feet above low-water level at Moncton. In other words, precisely at the time of half-tide Moncton becomes a tidal sink, sunk nine feet below the level of the water in the Bay of Fundy (Cobequid Bay). This difference of level produces the energy of motion, the high rate of speed, and the inclined plane; and at a narrow reach of the river the steepness of the incline is accentuated, resulting in the formation of the bore. The bore does not begin at the entrance of the river, but eleven miles above it. The inflowing flood, however, travels these eleven miles in two hours to a place called Stony Creek. The river then becomes contracted, and the next 8.47 miles to Moncton is made in one hour. The total run of the bore is twenty-one miles. The total difference in low-water level between springs and neaps, and between one set of springs and another, is little more than one foot in summer and still less in winter. The special measurements here quoted are from the Report of Progress for 1899 of the Canadian Tidal Survey, under the superintendence of Mr. W. Bell Dawson, Ottawa. Mr. Dawson also draws attention to an extinct bore in the river Shubenacadie, Nova Scotia:

It used to go up to Maitland, but a change in the sand-bars below Maitland now prevents it; as the tide flows up the river, however, it still breaks occasionally into a ripple.

The silting named has destroyed the sink—one of the precise conditions requisite for the formation of the bore. From all this it follows that the necessary conditions for the formation of a bore are twofold—1, A region of high water-level standing at one end; 2, a deep sink lying towards the other end. These two conditions, of course, are only temporary—looking at them from the point of view of the length of duration of the flood tide—but when they do exist in union, then it follows that the weight and pressure in the region of higher level in a broad estuary must give an enormous energy of motion to the flood tide as it sweeps through the contracted channel into the inland tidal-sink beyond. It is also clear that the higher the region of high sea-level above the temporary tidal-sink, and the steeper the grade of the watery inclined plane, the greater will be the height of the bore-breaker and the faster its speed.

The Bore of the Tsien-Tang.

At the city of Haining the frontal aspect of this bore is a wall of water about one mile wide, ten feet high, and travelling at the rate of eleven miles an hour. This grand phenomenon was carefully observed by Capt. Moore, R.N., and his observations are among the official publications of the British Admiralty. A full account, however, is given in "The Tides," and that account is accompanied by a diagram (Diagram 18), which gives a very striking view of the abnormal tidal conditions necessary for the formation of the bore. Simultaneous observations were made at Haining and at two tidal stations in the estuary—Rambler Island and Volcano Island—but the centre of interest lies between Rambler Isle and the city. At the time of low tide the region round Rambler Isle becomes a tidal sink sunk three feet below the water-level at Haining and ten feet below the water-level at Volcano Isle; hence tides flow towards it from both places simultaneously at that time. The total rise of tide at Rambler Isle is given at twenty-three feet, and when tide is high there it is low at Haining—the distance between the two places is twenty-six miles. The total rise of tide at Haining is eighteen feet, and that rise is made in the very short space of three hours. (Precisely the same condition as in the case of the bore of the Petitcodiac.)

The tidal differences at the three stations are the following:

Tide falls 1 foot below mean sea-level, and rises 6 above, at Volcano Isle.

Tide falls 11 feet below mean sea-level, and rises 12 above, at Rambler Isle.

Tide falls 8 feet below mean sea-level, and rises 10 above, at Haining.

The total rise of tide is 7 feet at Volcano Isle.
" " " 23 " Rambler Isle.
" " " 18 " Haining.

From all this it is quite clear that when tide is high at Rambler Isle and low at Haining the slope of the watery inclined plane between the two places has a grade of twenty feet in twenty-six miles—a very steep grade indeed for sea-water. But within the limits of these twenty-six miles the boundaries of estuary and river become greatly contracted, and in the contracted region the angle of the slope becomes enlarged, and at the same time there occurs an increase in the energy of motion and of pressure. Hence, by reason of all this, when the accentuation in the inclined plane becomes too great to maintain the form of the plane, the frontal waters fall forward into the form of the bore-breaker.

The Tsien-Tang possesses the two prime conditions requisite for the formation of the bore:

A. The region of twenty feet high level, when tide is high at Rambler Isle.

B. The region of sink, when tide is low at Haining, sunk twenty feet below the high-water level at Rambler Isle.

These two conditions exist at the same instant of time. The opposition of the high level to a contiguous low level is always present at that instant of time; they are absolutely inseparable then. Hence the appearance of the bore is a necessary result of the opposition; and it likewise follows that this bore must have a greater frontal height, and an accelerated speed, because of its larger proportions, than that of the Petitcodiac. As is the sharpness of the angle of the inclined plane, so is the height of the bore-breaker. At Haining Capt. Moore estimated that one and three-quarter million tons of water passed the point of observation in one minute. The frontal height of the breaker is said to be higher now than it was during the Taiping rebellion, suppressed by the late Gen. Gordon. If that report is correct, then the swish of the awful current of this tremendous bore has dredged the sink deeper since that war.

With regard to the bore of the Tsien-Tang, Prof. Darwin made the singular remark, in "The Tides," that "There is no bore down stream." Of course not. A bore in the ebb tide is unknown there, and impossible, for the simple reason that the conditions are absolutely wanting at the time of ebb to form a bore. At that time the inclined plane stretches in one long, flattened plane from Haining to Volcano Isle, a distance of seventy-seven miles; and at the top of that plane there is no great region standing at high-water level, nor is there a region of low-water level at the bottom—a tidal sink—because at Volcano Island the extreme rise, or fall, is only seven feet.

It is now several years since we came to perceive the true cause of the bore, and only then after a visit to the Petitcodiac and a close study of its tidal conditions. By the fresher data of Capt. Moore—given in "The Tides"—and by a study of Mr. Darwin's elaborate diagram therein, we felt assured that our conclusion regarding the conditions which cause the bore was founded upon well-ascertained scientific facts, therefore the correct solution of the problem; and the only solution founded upon correct tidal observation, so far as we are aware.

July, 1901.

GEOGRAPHICAL NOTES FROM THE YEAR-BOOK OF THE DEPARTMENT OF AGRICULTURE FOR 1900.

BY

ALBERT PERRY BRIGHAM.

This is a volume of 888 pages, and contains several papers of importance, not only to the farmer, but to all who are interested in the development of our national domain.

Three points may be specially selected from the report of Secretary Wilson, with which the volume begins. These relate to Forestry, Roads, and Irrigation. In regard to the first, Secretary Wilson says that public interest is growing with unprecedented rapidity, and that the calls for advice from planters and lumbermen far outrun the ability of the Division of Forestry to meet them. Similar is the case with the Office of Public Road Inquiries. More sample roads were built in 1900 than in any previous year, and the interest is widespread. Also, a report now in preparation on eight streams of California is believed to be

the largest and most comprehensive inquiry regarding irrigation laws, customs, and conditions which has been undertaken in this country.

Reference will now be made to some of the most important essays of the Year-Book.

Forestry.

Two essays deal with this subject. One discusses forest extension in the Middle West. The object is to show that planting will be profitable, and to suggest plans of procedure. It is stated that a ten-year plantation of catalpa in Kansas now shows a net value of $197.55 per acre. Great destruction of the native trees has taken place in the region. The more extensive remaining forests are in Arkansas; but these are rapidly disappearing. There is growing call for fence posts, railroad ties, and telegraph poles, and they are even now often worth more than it costs to grow them. The telegraph lines of the United States require 600,000 poles annually, and 90,000,000 railroad ties are needed each year for renewal. There is also needed lumber for furniture, implements, and vehicles, and 500,000 acres annually planted in the Middle West would not meet the needs. The Division of Forestry stands ready to examine land,

and to plan and oversee the work without charge to the planter. This is done through occasional visits of a forestry officer.

The other paper is devoted to practical forestry in the Southern Appalachians. There is already a serious reduction of the timber by improvident methods. Here are important problems for Western North Carolina and Eastern Tennessee, where there are one hundred kinds of native trees. The losses are due to leaving to rot trees of unsound base, to poor judgment in sawing, to high stumps, and to careless felling, causing lodging and crushing of saplings. There are two classes of forest. The first has suffered from cutting, from fires, and from grazing. Such forests need removal of worthless kinds, as on the Biltmore estates, where 3,000 cords of firewood are cut each year, to the improvement of the woodlands. Cattle should be kept out, and fires checked. The second head includes the higher mountain timber, in which diseased or overripe trees should be removed; enough trees should be left for density, for seed, and to provide for repeated crops of the best timbers.

In an appendix it appears that thirteen States have offices for forest work. There are twenty-one forestry associations, of which four are in California. We have three schools of forestry: the Yale Forestry School, giving a graduate course of two years; the New York State College of Forestry at Cornell University, with a four-year course and 30,000 acres of State forest as a demonstration area; and the Biltmore School of Forestry in North Carolina. Forty-eight other institutions offer more or less instruction in the subject.

Roads and Road Making.

Here we find two essays. One sets forth the best ways of making mountain roads. Mineral deposits have led to the making of all such roads west of the Missouri River. Everywhere the loss from the use of bad roads would in five years construct good highways for the carting of ore, fuel, provisions, and timber. There is an interesting account of the road grades suited to various traffic. A four per cent. road (4 feet in 100) is the maximum for pleasure driving. Twelve per cent. is the highest permissible grade for freight, and eight per cent. is much better, and usually practicable. A fifty per cent. greater load can be hauled by a team on an eight per cent. than on a twelve per cent. incline. The rest of the paper is given to the more technical matters of construction.

Selection of Material for Macadam Roads is the theme of a paper by Mr. L. W. Page, Expert in Charge of Road Material Laboratory—

an official title that is suggestive of great recent progress in this field. Credit is given to bicycle organizations, to the adoption of horseless vehicles, and to the awakening of our farmers to the value of easy transportation. Hardness for resisting wear, toughness for resisting fracture, and the binding or cementing quality are shown to be the needed properties of road rock, and these must be adapted to the bulk and kind of traffic. Urban, suburban, highway, and country road traffic are shown to vary in important ways in the strain put on roads, and thus the need of expert work appears in this as in other departments of practical science. Laboratory tests of road-material have been made in France for thirty years, and their value is demonstrated. In this country such laboratories are organized in Johns Hopkins University, Columbia University, Harvard University, Cornell University, the University of California, and the Wisconsin Geological Survey. The laboratory in the Department of Agriculture will test, free of charge, road material for any resident of the United States. Before a report is made the laboratory requires a record of the traffic on the roads to be maintained, and expert advice is then given. The National Good Roads Association has its headquarters at 928–929 Marquette Building, Chicago.

Introduction of Foreign Fruits and Grains.

Four papers are mainly occupied with this theme. One relates to Smyrna Fig Culture in the United States. Elaborate experiments have sought to secure the fertilizing of these trees by means of a fig insect imported from the East. It is a promising industry for the interior valleys of California, also for the fruit-growing parts of Arizona, New Mexico, and Texas. Experiment stations in Louisiana and further east are urged to give the subject their attention, the Smyrna fig being vastly more valuable in the market than the California fig. The aim is to supply the place of importations, now amounting to several hundred thousand dollars per year.

We have next the date palm and its culture. Yielding in importance only to the Smyrna fig and the Zante currant is the importation of this fruit. The requirements are: plenty of water for the roots, and a hot, dry atmosphere for the leaves, and winters not too severe. The tree will thrive as in Florida, where the summer is not dry enough nor hot enough to mature the fruit. It is the chief product of the Sahara region, and it is grown commercially at a single point in Southeastern Spain. There have been sundry attempts to naturalize the date palm in this country from the days

of the early Spanish missionaries in the South West. These led to the importation, in 1900, of a quantity of shoots of the best dates of the Algerian Sahara. Experiment is in progress with most of them at the University of Arizona, a few being sent to the University of California. Temperatures below 20° F. are likely to be injurious or fatal, and the fruit will not ripen unless the mean temperature goes above 80° for a month in the summer, with a mean of 70° from May to October. The soil, on the other hand, must be moist, but for arid regions the plant has the great advantage of thriving on very alkaline soils. Orchards come to bearing in six to eight years. A single tree in Arizona, eight years from the seed, bore 400 pounds of fruit in a season. The valley of the Colorado River, the Colorado Desert of Southeastern California, and the central valley of California are the most favourable regions for this fruit. The Colorado Desert is deemed the best date region in the New World. It would be a fact of high interest if this region of fearful heat and great aridity could be so watered as to grow rich with this Old World fruit. The Arizona region is discussed at some length, and the prospect of growing our own supply of dates is held to be good.

A third article discusses successful wheat-growing in semi-arid districts. The author notes the fact that in certain parts of Kansas emigrants from the cold and dry parts of Russia have reared crops when others failed. With a rainfall under thirteen inches, the lower Volga district is one of the chief wheat regions of Russia. Such precipitation means aridity, being several inches less than in the semi-arid belt of the Great Plains.

Increase of the crop in this region is to be gained by selection of hardy varieties and by proper methods of culture. The hardiest sorts of Russian wheat are likely to succeed in the West, especially those called the maccaroni wheats; and to this end much experimental proof has now been gained. The essential in culture is to conserve the moisture. By such care, and by rigid selection of the hardiest plants, the author believes that our winter wheat area "may be extended northward almost indefinitely."

A fourth paper of great value is devoted to commercial plant introduction in general. The present efforts in this direction derive additional worth from the consideration that our native plants, some grasses, and forest trees have played an unimportant rôle in the agricultural development of the land. The Department seeks chiefly to secure adequate experimentation, to prevent introduction of plant diseases and noxious insects, and thus to promote economy

and safety. A single important case of recent years is the importation of Kafir corn, of which 600,000 acres are now planted in the single State of Kansas.

Another recent importation is the Kiushu rice, from Japan, now grown in Louisiana and Texas, and very superior, in that it does not deteriorate, and is so hard that it does not break in milling. Many other illustrations of recent importations of great value will be found by the reader of the article.

Free Delivery of Rural Mails.

This subject is given place as of special interest to the farmer. The growth of the system has been rapid, from 44 routes in 1897, 128 in 1898, and 634 on Nov. 1, 1899. By June 30, 1900, the number was 1,214; and Nov. 1, 1900, 2,551 routes were being served. It is shown that the growth of the system will not be a burden upon the postal service, but will even become a source of profit. The history of the movement is outlined, its advantages are discussed, and the personal verdicts of a number of farmers as to its operation are given. Prompt receipt of market and weather reports, closer contact with the world, with greater intelligence and interest in rural life, are the chief advantages set forth.

FIORDS.

BY

GEO. D. HUBBARD.

INTRODUCTION.—ON THE SCOPE AND MEANING OF THE TERM.—*Fiord* is borrowed into English from the present Norwegian *fjord*, which has developed from an earlier form, in* Old Norse *fjordr*, and is now applied to the long, narrow, deep arms of the sea which occupy the distal portion of deep, steep-walled, rock channels on the western coast of Norway. The English word *forth* and the Scottish *firth*, applied to quite similar embayments in different parts of the British Isles, also the English verbs *fare* and *ferry*, have developed from the same root. The primitive Indo-European root $\sqrt{\ }$*par*, from which these several words have sprung, has, in general, the meaning of "motion forward," "passing over" and then "to travel." Possibly the word in its early form was given to the fiords from the fact that the settlers along the sides of the fiord found it nearer to go across than to go around. A significant fact comes out here in relation to Norway's commerce and her coast. Fifty-three per cent. of the boundary is water, and forty-seven per cent. is land where the country backs up to Sweden; but ninety-five per cent. of all Norway's export trade goes out over the water boundary. No wonder the idea of travel and crossing over is in the name given to fiords.

The derivation of the word is quite certain, but the present meaning is in some confusion. This confusion has arisen from three sources—

(*a*) The term has been used both in a technical and in a popular sense. This is legitimate, and may be continued, as is done with multitudes of scientific words.

(*b*) It has been used with three distinct meanings—1st, embracing only the water; 2nd, including both water and containing walls; and 3rd, the walls only.

(*c*) Fiords, like other physiographic types, grade into related forms bearing different names. This source of confusion cannot be avoided; but the perplexity can be overcome in part by recognising its source. Many of our terms do not admit of exact limi-

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* I am indebted to Prof. W. H. Schofield of Harvard for these notes on derivation.

tations at present, and others which might be so limited never have been.

Examples of the three types of definition for *fiord* follow. Penck* illustrates the first:

> Typical examples are long, slender, much-branched bays which extend inland often over 100 km.

Geikie† uses the second type:

> A fiord is a long, narrow, and often singularly deep inlet of the sea which terminates inland at the mouth of a glen or valley. . .No line of demarkation can be traced between the water-covered portion and that beneath the sky.

Here the author starts with a definition of the first type; but the closing sentence and the context show that he really holds the view of the second type. LeConte‡ employs the third type:

> Fiords, then, are deeply-eroded land valleys—usually half-submerged glacial valleys.

These quotations are merely types of classes. Each type could be duplicated several times, and occasionally two types can be found in the same book.

The dictionary study of the word has revealed an interesting series of definitions. From Webster's editions, beginning with a small book and passing through a series increasing in size and comprehensiveness, the following were taken:

Webster's Abridged:	Fiord,	an arm of the sea; a bay.
" Condensed:	"	a bay or inlet with high banks.
" Academic:	"	a narrow inlet of the sea between high rocks.
" Collegiate:	"	a narrow inlet of the sea between high banks or rocks.
" International:	"	a long, narrow inlet of the sea having precipitous walls.

Not one of these definitions defines sufficiently to exclude embayments, which are never considered to be fiords; nor do they call attention to several of the essential characteristics of fiords.

Worcester's Comprehensive Dictionary gives, as equivalent to fiord, these terms:

> (*a*) Firth; (*b*) a rock-bound strait; (*c*) a frith; (*d*) a strait of the sea; (*e*) an estuary.

What idea of a fiord will a student get from any or all of these definitions? And yet why condemn the dictionary? How can a lexicographer be expected to be able to define a scientific term which specialists have failed to delimit? It seems plain that the

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* Morph. der Erdoberfläche, 1894, II, 563.

† Textbook of Geology, 1893, 291.

‡ Elements of Geology, 1891, 574.

best way to establish a clear definition of *fiord* is to observe carefully forms acknowledged by all to be fiords, to note all their common features, and from these to deduce a definition. Then, by comparison, related forms and those so ill-defined by nature as to be questionable can be put where they belong.

SECTION I—A DISCUSSION OF THE CHARACTERISTICS OF FIORDS.

Fiords are features of the coast of Norway. This all will grant. Greenland, especially on the western side, has fiords; northwest Scotland and northeast Labrador also have them. Features common to fiords of all these regions will certainly be accepted by everyone as fiord characteristics. An arm of the sea lying in a channel of peculiar form, then, is a fiord, and it becomes our task to describe this channel and to discuss its relation to the water. Both where occupied by the water and inland from the head of the water this channel is broadly U-shaped, or trough-shaped, comparatively uniform in width, and often nearly straight. The ratio of length to breadth of the water-covered portion varies. An average is about 30:1. This portion is frequently 75–100 miles long. The water may occupy only the outer portion of the channel, or may extend over a half, or even all of it; in the latter case sometimes terminating in a cirque. The channel is always deep, and the water within is of considerable depth, frequently exceeding several times that of the foresea at the mouth, and equalling one-half the average width.

Steep, smoothed walls of bare rock are features very striking and constant. The slope of the wall suffers no change at the water's edge, but continues steep to the bottom. It may be of nearly the same steepness from summit to base, or the descent may be in huge steps, or with a steep section in the upper part and a gentler slope towards the bottom, or the reverse. One may frequently sail along a fiord an hour or more without finding a possible landing, so precipitous and continuous are the walls. The average inclination of the walls of the fiords of Europe has been given as 35°. This, of course, includes many of much lower angle than the more typical ones. In order better to realize the steepness even of this angle, recall the fact that skilled mountain-climbers consider an ascent of 37° scarcely climbable unless it be clothed with vegetation. The channel walls are usually sub-parallel and nearly straight, and the straightening and smoothing seems to be the result of recent changes. There are marked differences between the fiord channel and the valley of a stream. In the sub-mature river valley, in

strong relief, spurs run out into it some distance, standing as buttresses against the walls; and in young valleys, as seen looking up or down stream, the spurs seem even to overlap, entering alternately from one side and then from the other. But in a fiord channel such spurs are of rare occurrence. The appearance is rather that the spurs have been brushed off, leaving a steep wall.

The floor of a fiord is somewhat uneven. It does not have a continuous slope from the head seaward, but it may be very far below the surface of the water in the middle part, and near the surface toward or at the mouth, thus making a great, much-elongated basin. It frequently happens that beneath a single fiord there are two or several of these basins separated by sills or swells where the floor approaches the surface. Transversely, each depression is broadly U-shaped, or trough-shaped, with steep descents on either side and a very low gradient across the bottom. Longitudinally, the elongated depression gradually shallows from the maximum depth toward either end. The floor gradient, local as well as average, is greater seaward than landward. In Sögne Fiord, Norway, the mean floor gradient from the deepest part to the mouth is 62 minutes; from the same depth to the head it is 39 minutes. A mean floor slope for an entire fiord of 6° to 7° is very rare, but for individual basins slopes may often be much more. Little regularity of form exists among the depressions or basins.

As mentioned above, sills transverse to the channel rise between the basins in a very peculiar manner. A few soundings from Sögne Fiord and others will show something of their form. At the mouth of Sögne the floor rises in a sill until the water is but 180 metres deep above it; while the maximum depth several miles inland is 1,242 metres. Loch Hourn, Scotland, has four basins, whose depths are respectively 18m., 49m., 38m., and 49m., while the sills between them lie beneath from 1 to 13m. of water. The freshness of the surface water and the constancy of the water temperatures in the basins at all seasons of the year are good evidences that the sills form barriers completely across the channel. In many cases the sills are known to be of bare bed-rock; while in some, as at Loch Hourn, they are known to be covered with deposits of loose material. As a rule the channel widens where the sill occurs, and narrows in the deepest places. Many fiords become much deeper where they receive a considerable tributary. In the bends of fiords the deepest part of the channel is not in the centre, but is near the outside of the curve.

The channel in which the fiord lies usually extends some distance

landward beyond the head of the fiord and rises to the level of the highlands in the interior. The floor and walls show no change of character at the end of the fiord, but the floor rises by more steep and less steep reaches, or by huge steps, with basins on the tread, or by a gentle incline, with swells rising occasionally transverse to the channel; while the walls continue unchanged in their main features. They are steep, sub-parallel, smoothed and scratched as in the part of the channel occupied by the water. Lakes often lie behind the swells in this upper part of the channel, like a row of shining beads, sometimes several on one string. By the overflow of the lake the sill is sometimes cut through, exposing a section. Usually the sill, thus exposed, is of firm bedrock, but occasionally it is of drift.

Many lakes, having similar rock basins of great depth, and walls like those of fiords, occur on the eastern slope of the Scandinavian mountains. These lakes and their associated channels are so strikingly like the fiord channels on the western side of the mountains that one writer has enthusiastically remarked:

> The Swedish slope of these mountains would become a fiord coast if the piedmont were covered by the sea.

Likewise, if the sea washed the eastern slopes of the mountains of New Zealand, of the southern Andes, and of the Scottish Highlands each region would possess a fiord coast. This is equally true of the slopes of the Alps. Nordenskjöld* says that most fiords and up-valley lakes have rock basins. If these channels containing lakes, and those without lakes, but in the fiord and lake regions, were occupied with water, they would be as much fiord channels as any along the present coast.

The upper parts of many fiord channels in Greenland, Norway, and Alaska are at present occupied by ice tongues, some reaching to the water's edge and, as Russell thinks, far out into deep water, but creeping on the bottom because too thick to be floated.

The fiord channel not only extends landward beyond the head of the fiord, but sometimes leads out across the continental shelf a considerable distance. Here, too, it maintains the uneven floor as in other parts. There is usually a very marked rise of the floor to form a sill across the entrance to the fiord. Fiord channels are sometimes connected, especially in the distal portion, by cross-channels. These, when occupied by water, make cross-straits, called sounds in Norway, and partake of the nature of the fiord in every way, but are never deeper than the fiord. Where their num-

* Bulletin Geol. Inst. Upsala, 1899, 4, 220.

ber is great the number of off-shore islands is great, and the latter form an island belt or zone of large and small rocky islands, arranged in no apparent order. The outer mouth of the fiord lies at the seaward margin of this belt, and the inner mouth at the landward edge of it. This belt or field of islands, called in Norway *Skjaergaard*, is more fully developed along coasts of weak relief.

Many lateral streams which enter fiord channels do so from discordant high-level waterways—*i. e.*, they come in high up on the walls of the master channel, giving the impression that the latter had been cut much deeper than the former. For these lateral channels, with high-level discharge, Gilbert has proposed the name of *hanging valleys*. Their waters descend by steep rapids, or by a series of cascades, and occasionally by taking one grand leap from a height of several hundred feet to the fiord below, clearing the wall in such a manner that boats can pass between the falling water and the rock. The discordance of the side-valley floors with the master channel floors is a very constant feature in fiord regions. Sometimes the former is many hundreds of feet above the surface of the fiord, sometimes it is below; but even then soundings may show that if the water were withdrawn from both, the lateral would appear as a hanging valley with reference to the main channel. Near the mouths of fiords some of these high-level side channels lead downward away from, instead of towards, the master, which is a strikingly peculiar feature. Observation goes to show that this is not at all uncommon along coasts possessing fiords. They have the appearance of distributary channels, and may be so called. Any theory for the origin of fiords must take into account these relations of side streams and valleys in order to explain the fiords. Several other characteristics have been noted by different authors; but they prove to be rather uncommon than common, hence cannot be called characteristics. Among them may be mentioned a tendency of fiords in some regions to be sub-parallel to each other and at right angles to the coast.

Summary.

From the preceding paragraphs it may be seen that certain features of fiords and their channels are much more constant than others; many features vary in form, others are sometimes wanting. The more constant ones, then, may be called the essential features, and the others variable or secondary features. (*a*) The inequality in the relief of the channel floor is constant; but the form of the basin, the number of basins and swells in one fiord, and the depth of the water over the sills, are all points which may vary. (*b*) The walls

are of rock, high, steep, and smoothed; but the degree of steepness and smoothness and the height vary through a wide range. (*c*) The channel continues landward from the head of the fiord comparatively unchanged; but it may extend a long or short distance; it may or may not contain fresh-water lakes or an ice-tongue. (*d*) Commonly, the channel does not extend out beneath the fore-sea, but is closed by a swell. (*e*) High-level lateral valleys pouring their streams into the fiord over the edge of the fiord walls or through a high notch are constant peculiarities; but these hanging valleys may vary in height from a few thousand feet above the surface of the fiord to some distance below the surface. Toward the mouth of the fiord the high-level branches may lead away from the master as if they were distributary channels. (*f*) Sounds or straits and islands occur along the shores of fiord coasts. They may be many or few, small or great. (*g*) Parallelism of fiords and their direction relative to the coast are features much modified by the regional topography and rock resistance; hence they cannot be emphasized as characteristics.

As a conclusion to this section are presented three forms of a definition for the word "fiord." It is hoped that they will be sufficiently substantiated by this and other descriptions to give them general acceptance. Each conforms in length to the usage of a recent, established type of dictionary:

COMMON SCHOOL SIZE: Fiord, a long, deep, uneven-floored arm of the sea.

ACADEMIC SIZE: Fiord, a long, deep, uneven-floored arm of the sea, entering a region of strong relief.

UNABRIDGED SIZE: Fiord, a long, deep arm of the sea, occupying a portion of a channel having high steep walls, a bottom made uneven by basins and sills, and with side streams entering from high-level valleys by cascades or steep rapids.

SECTION II—ON FIORD REGIONS AS A TYPE OF COAST: A COMPARATIVE STUDY.

Besides Norway, Scotland, Greenland, and Labrador several other regions furnish excellent examples of fiords, among which are western British America and southern Alaska, the Chilian coast, South Island of New Zealand, and many islands in each polar region. The coast of Maine and most of the land bordering the Baltic Sea and its entrance have fiord-like forms which depart materially from the typical examples previously described.

Berghaus* and others have studied these regions as types of coast, and have mapped them under two or three distinct types.

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* Physical Atlas, 1892, Map 19.

In Maine the relief is weak; the embayments are not bounded by steep, high, sub-parallel walls, but by gently rising walls of moderate height, which contain between them an inlet rapidly widening seaward. The maximum difference of floor relief is not over 30m., but there are often distinct basins and sills. In the Baltic Sea and along Denmark coasts are many embayments differing locally from each other, and as a group, from the fiords of Norway, and yet presenting so many similarities that some authors class them as fiords, while others, more conservative, call them fiord-like features. The names *fiärden*, *shären*, and *föhrden* have been given to them, each for a distinct type of form. The first term is applied to embayments in regions where there are few islands, and *shären* is used for the passages and straits where the coast is much dissected, hence abounding in islands and rock reefs, but with very few embayments. Any map on sufficiently large scale will help to locate the regions having each type. The embayments called *fiärden* are narrow, tortuous sea arms, with some shallow basins, best developed where up-valley lakes intercept the sediments. Channels in both *fiärden* and *shären* types are not deep; the walls are low and rise at a small angle. The relief of the lands is weak, only a few hundred feet where strongest, usually much less. Weak relief of lands and little depth of water seem to go together. The *föhrden* type of embayment occurs on the eastern coast of Denmark, and along the coast of Sweden near Cimbrishamn. The relief of the land is weak, and the water in the channels is shallow. The form of the embayment varies much. Some are narrow and intersect, forming a net; some are very tortuous, and others are sack-shaped, broad within and constricted at the mouth. Local depressions or basins occur in some of these bays, and in one or two cases a sill is known at the entrance. Since a good ship channel goes to the head of the inlet, and the water is not too deep for easy anchorage, while the walls are not so steep as to interfere with landing, *föhrden* make excellent harbours.

The relation of these three forms to typical fiords has been generally overlooked. The most pronounced differences between the true fiord and the fiord-like forms are in the height and steepness of the walls and in the depth of the water in the channels—differences probably due to the weakness of relief on the coasts exhibiting the fiord-like types. The next section will give additional material on the forms.

(*To be continued.*)

SOME ECONOMIC ASPECTS OF THE HEAT AND DROUGHT OF JULY, 1901, IN THE UNITED STATES.

BY

ROBERT DE C. WARD.

Large sections of the United States east of the Rocky Mountains suffered from a prolonged spell of extreme heat and of drought during the latter part of June, and in July, of the present year. Meteorologically, medically, and economically, great interest attaches to this heated term. The meteorological and the medical aspects of the question are likely to receive the most attention. It is the purpose of this article to point out some of the ways in which this remarkable spell of weather affected trade, industry, and finance. The sources of information have been the weekly *Climate and Crop Bulletins* of the Weather Bureau, and the well-known trade journals, *Bradstreet's* and *R. G. Dun and Co.'s Review.* The first-named publication distinctly emphasizes the meteorological side; the two journals last named aim to present a true statement of trade conditions without any special prejudice in favor of meteorological controls.

Summarizing, in a very general way, the meteorological characteristics of this hot spell, it may be said that the excessive heat began during the last days of June, and continued with but little relief, except locally, to the end of July. Record-breaking maximum temperatures were observed at a large number of stations, readings of 100° and above occurring in many places for several days in succession during part of the month. The daily temperatures were quite commonly well above the average, the excess frequently reaching 5° to 10°, or more. During this prolonged spell of hot weather the rainfall was markedly deficient over many sections east of the Rocky Mountains, and hence there resulted a drought of far-reaching extent.

The crop conditions were, on the whole, satisfactory until about the middle of July, when corn began to show the injurious effects of the excessive heat and drought in the southwest. Locally, some damage was done to wheat and some to oats; while cotton also suffered more or less from drought over considerable sections of the cotton States. Occasional local rains—as during the weeks

ending July 22 and 29, for example—helped to make good a part of the damage to corn or cotton which had been caused by the drought. The chief interest, so far as the crops were concerned, centred in the condition of corn.

One effect of the extreme heat upon general trade was observable at the very beginning of the hot spell, in June, and continued more or less distinctly as a characteristic of the four weeks of July. This was a marked stimulation of retail trade in seasonable goods, *i. e.*, light-weight clothing; "white goods"; straw hats; outing shirts; summer shoes; sporting goods, and the like. So emphatic was this control that the distinguishing feature of the retail trade during more than one week was the "very large distribution of all classes of summer goods, induced by the hot spell." Another interesting point in this connection was that the continuance of the intense heat over much of the country had the effect of carrying the sale of summer goods beyond the usual time; of leading to "considerable re-orders for summer wear" from wholesalers, and thus of stimulating trade along these lines until late in July. Towards the middle of the month there was, on the whole, something of a general adjustment of business to the conditions of intense heat which had already prevailed for more than three weeks, as is reflected in a report from St. Louis, to the effect that business interests were "resolutely adapting themselves to conditions over which they can have no control."

Besides the stimulating effect of the hot weather just referred to, another effect—and this an unfavorable one—was emphasized from week to week in many of the trade summaries from different cities within the districts of intense heat. This was the curtailment of almost all branches of trade other than that in summer goods. This depressing influence is clearly described in a report from Boston, July 6, to the effect that "buyers have been few, and only necessities have prompted purchases;" or again, in another report from a later week, that owing to the limited stocks of dry-goods on hand considerable shopping on the part of buyers to find requisite supplies was necessary; "and with the daily temperature well up in the 90's this is something most buyers declined to do." That "shopping" was decreased by the heat, and that goods were ordered by mail instead, was a natural result of the torrid weather conditions, and was clearly brought out in a number of cases. The emphatic statement from Memphis, July 12, to the effect that business was "held in check by drought reports," and the one that "torrid weather conditions depressed retail trade in all lines," are

representative of many trade reports from city after city for two, three, or even four successive weeks in some cases. Intense heat, however, is not necessarily adverse to general retail trade, provided there are favorable crop prospects. This is clearly brought out in such reports as one from Chicago, where, in spite of the heat then prevailing, sales of fall goods were enlarged owing to favorable crop reports, and one from St. Louis, where the country trade was "sustained by the result of the wheat harvest." On the other hand, again, trade may not respond immediately even when crop prospects are good; for when the weather is fine and farmers are busy harvesting, they have little time for trade, which slackens in consequence. Thus, Minneapolis reports on July 12 that less merchandise was being shipped by jobbers, because the farmers were "taking advantage of the fair weather to finish their work and did not have time to get into town."

A study of the special characteristics of the weather over different sections of the country from week to week brings out details of great interest. Thus, during the second week of July, for example, business was reported as of a "midsummer character," *i. e.*, normal, in the east. This is certainly partly explained when we learn that the temperatures for the week were nearly normal, or were slightly lower than usual, over many of the eastern States. Reports of a marked improvement in trade came from a number of cities situated in districts where the temperatures for the week were not far from normal. The statement from Louisville is fairly representative: "A few recent days of nominal summer weather have given a spurt to retail trade." During the same week in the southwest, however, trade conditions were adversely affected by drought and hot weather, "which superinduced a tendency on the part of many to cancel orders previously given." The third week of the intense heat and drought thus affected not only the trade of that particular week, but led to the cancellation of orders given in previous weeks. These cancellations were chiefly of orders for agricultural implements, dry goods, hats, and foot-wear; they came from the districts of the Southwest or the South where corn or cotton had suffered severely from the drought, and they continued to come in as long as the drought lasted. This was naturally a disturbing factor in the trade conditions of many Western and Southern cities.

The heat of the first week of July "caused a practical suspension of industrial activity in many cities." "Numerous prostrations from heat caused humane employers to close their mills

during the most distressing hours, thus bringing about some restriction of business." At Pittsburg all the mills were "badly crippled by the hot spell," and similar reports came from Boston, Philadelphia, and other cities. Steel, tin-plate, and cotton goods were noted as especially affected by these shut-downs. In close connection with these voluntary shut-downs on the part of employers comes the effect of the hot weather upon the strike of the steel-workers in Pittsburg, one of the trade journals reporting that the striking employés were "mostly content to take a rest during the hot weather," and consequently were not so anxious that a settlement should be reached. *Bradstreet's* of July 20 makes an editorial comment regarding the strike which emphasizes this point still further. "The present strike situation," says that journal, "suggests several reflections. It would be easy to magnify its importance if account were not taken of the fact that the present movement is coincident with the time of the year when a heated spell exerts its effect upon the imaginations of men ordinarily regarded as calculating, and when holiday-taking is the rule."

The week ending July 22 brought local showers over portions of the drought-stricken districts; and although these showers were in most cases but scattering, and much more precipitation was needed to repair the damage already done by the drought, there was a noticeable improvement as regards crop outlook and business in the sections where the rains fell. A characteristic report from St. Louis, July 19, stated clearly enough that "the business situation hinged upon the question of rain." On the same day New Orleans reported, "There is evidence of a more healthy tone pervading all lines of business as a result of frequent rains." At Baltimore, however, trade reports note that the rains had been excessive in some sections, and business had suffered in consequence.

The week ending July 29 gave "good rains in the spring-wheat and northern corn-belt . . . [which] caused reverse movements and the growth of a better feeling." "Advices of lower temperature and moderate rains came as a great relief to business throughout the country"; "needed rains in Texas and the Gulf Region, and hot weather and rains in the South Atlantic Region . . . improved cotton-crop advices and trade reports in those regions."

The cattle, meat, dairy and produce markets all showed marked effects of the excessively hot weather, which was naturally "a disturbing factor in markets for perishable goods." At the very beginning of the hot spell the perishable nature of butter and eggs

caused a rise in price, which was well maintained. The shortened supply of milk, due to the drought, was another factor in advancing the price of butter, and also caused the shut-down of a number of sugar-of-milk factories. Fruits and vegetables became scarce throughout the drought-stricken districts, and advanced in price. Fruits were in some cases reported as dried on the trees. Because of the inferior quality, scarcity, and high prices of fruits and vegetables there was a great demand for canned goods, the prices of which at once tended upward. Had it not been for the drought, the year 1901 would probably have been a very poor one for packers and jobbers of canned goods, because a very heavy supply had been carried over from the previous season. At Boston the shoe and leather market at the end of June showed an advance in hides, partly "on account of the smaller number coming into market as a result of the decreased sales of fresh meat during the heated term."

The drought and consequent lack of pasturage in the Southwest led to record-breaking shipments of cattle and hogs to market at Kansas City. This rush to market began early in July, and the receipts at Kansas City for the month exceeded those of July, 1900, by 263,000 head. The cattle were not shipped because the market invited them, nor because the stock was in the best condition, but simply because of the inability on the part of the stockmen to feed the animals. This extraordinary rush of live stock resulted in an over-supply of young cattle. The market was so overstocked that buyers dictated prices—a fact which operated to the advantage of the packers. The situation in the hide market was much complicated, and tanners were helped to hold down the price of hides. Smaller requirements in the way of corn for fodder, and restricted subsequent arrivals of cattle, were expected. Throughout July the prices of live hogs and of pork products were much affected by the price of corn.

Of all the economic aspects of the heat and drought of July the greatest interest attaches to the prices of stocks and cereals. During the first few days of July the "oppressive weather conquered option traders to such an extent that speculation was curtailed." Wheat was "lower on liquidation, induced by good crop reports, and despite confirmation of the heavy deficit in the German crop, the poor French crop, and of the short yield in Hungary, with doubtful prospects in other countries of Europe." On the New York Stock Exchange there was very little activity. The Fourth of July holiday (Thursday) was extended through the week; the

"record-breaking temperature made one extra day desirable." The uncertainty about the corn crop, due to the injurious effects of the drought, justified "some hesitation on the part of investors in railroad securities."

One of the most important developments of the second week of July was "the rampant speculation in corn and oats, due to reports of exceedingly heavy damage in the Missouri Valley belt." Stocks were so excited, owing to the crop damage reports from the corn-belt, "that they disregarded the indication of a record wheat crop." "Bearish interests" were "prompt to proclaim that the total failure of corn was in prospect, with an attendant diminution of railroad traffic at the West." On the strength of such reports "the market broke badly." The heaviest declines came in the stocks of railroads which were likely to be affected by a partial failure of the corn crop in the Southwest. Atchison and Rock Island were good examples. The preferred stock of Atchison fell to 92¾, while the common stock sold down from 86¼ to 70. Rock Island declined from 151 to 132½. Reports that rain was likely to fall in Kansas caused a rally from the low figures. The market in cotton was "irregular and professional," weather conditions in Texas playing an important part in bringing about changes in prices.

The effect of the weather conditions—real or speculative—of the week ending July 20 upon the prices of the staple products was very interesting. "It has been a weather market for the cereals," says one trade journal. The week began with a severe break in corn, "but quotations hardened again as the week advanced on reports that the rains falling have only afforded partial relief. The close of the week again finds both cereals (wheat and corn) at top prices, that for corn being the highest for years." The situation was, however, "relieved by moderate rains at many points, and also lower temperature." The cotton-crop outlook was reported as greatly improved by rain. "More encouraging weather reports, and less interest by exporters, were the chief depressing influences" on the price of cotton. In spite of the short corn crop, the large wheat yield made it evident that the cereal production of the West, as a whole, would furnish abundant traffic for the railroads. The appearance of rains in certain parts of the West led to considerable repurchasing of railroad stocks by capitalists who had sold Granger and Pacific stocks on the unfavorable crop outlook of two weeks before. Thus, there was considerable investment buying of Atchison preferred stock on the news of rain in Kansas and the expectation that at least a moderate corn crop would be secured in that

State. The common stock rose from 68½ to 78½. Rock Island was a very strong feature, "and the Grangers generally responded promptly to the improvement in the corn-crop outlook."

The high prices of corn in this country during the week ending July 27 had their natural effect upon the amount of that cereal exported by other countries, which reaped the "benefit of high prices made in this market." Argentina sent "a million bushels more than the United States, and Danubian ports nearly as much." Stocks moved vigorously all the week, "declining on Chicago's advices of heat in the corn-belt, and rallying when the drought was reported broken." The highest non-corner prices paid for corn since 1894 were paid during the week at Chicago and New York. Stories of damage by heat and drought to other cereals made the three great staple crops—corn, wheat and, oats—move up sharply together. Reports of scattered rains caused a reaction from the high prices. Little attention was paid in the New York stock market to any news except that relating to corn-crop conditions, because of the general impression that the serious reduction in the yield would materially affect many railroads. The direct loss to the railroads in the diminished tonnage of corn itself is naturally an important item; but there is also a falling-off in the general business of the districts affected by the drought, and a corresponding diminution of the general tonnage of the roads. For some months confidence had been expressed in the increase of the Union Pacific's dividend rate on its common stock from 4 per cent., it being generally expected that the rate would be raised to at least 5 per cent. The drought and damage to crops in the territory tributary to the Union Pacific in Kansas and Nebraska "created an unfavorable feeling," and "raised strong doubts as to the possibility of any increase in the 4 per cent. dividend on the common stock." The corn-crop situation made the Granger and Pacific stocks the feature of the railroad share list. Union Pacific was one of the most prominent stocks in volume of transactions, and sold down very sharply from 104½ to 93¼. St. Paul fell from 164 to 152½, and the other Grangers were proportionately affected. Unfavorable crop news led to some selling of Union Pacific "convertible fours." The cotton market exhibited considerable weakness, one factor in causing which was the precipitation in the States where moisture had been badly needed.

After about one month of intense heat and of drought the end of July and the first few days of August at last brought lower temperatures and good rains over most of the drought-stricken districts.

The relief to trade was immediate and general. The rains throughout the western half of the country had "the expected effect of inducing a more cheerful tone," and the feeling was decidedly more hopeful than a week or more before. In the great corn States a much larger proportion than usual of the year's crop had been planted late, and this late corn experienced a general improvement, although the early corn was practically ruined. A large spring-wheat crop was practically assured by the rains. Cotton-crop conditions at the South also improved, and trade reports were consequently more cheerful from Southern cities.

An abundance of forage supplies for cattle was now certain. The Western farmers, therefore, regained courage, and the rush of cattle and hogs to market stopped. Cattle receipts at Kansas City fell off 25,631 from the preceding week. The pressure in this line being removed, many of the cattle which had been sent to market were not slaughtered, but were kept to be fattened for the dressed-meat market. Hence a great accumulation of skins was no longer expected.

The most unfavorable trade reports naturally came from the Central West and Southwest, where the loss from drought had been greatest. Kansas City reports that anxiety had been followed by "a feeling of relief and hopefulness;" cancellations had stopped, and country merchants had taken new courage. The bank clearings for July at Kansas City were the largest on record, on account of the heavy receipts of cattle and hogs. For the country as a whole, July bank clearings were limited, as might be expected, by the "intense heat and drought."

In the New York stock market the break in the drought was followed by a general improvement in quotations for railroad shares. Support was given Southern Pacific on the theory that a dividend on that stock was more likely because of the possible diminution of the Union Pacific's earnings, resulting from a reduction of the corn crop. The news of rain in the West caused decided sharp advances in the leading Granger and Pacific shares. Union Pacific advanced from 98⅞ to 101½, and nearly all of the securities which had been affected by speculative bear-selling, on the reports of damage to crops, also rose. St. Paul advanced from 160½ to 163⅜, and Missouri Pacific rose from 98 to 102¼. Southern Railway preferred and common stock developed "a certain amount of heaviness," because of the feeling that a smaller cotton crop would unfavorably affect the earnings of that road.

Fluctuations in corn continued, as conflicting reports of greater

or less loss were given currency. Good spring-wheat crop reports and liberal arrivals at interior cities weakened prices of that staple. Cotton was weaker, owing to the arrival of needed rains. Meats were firmer as western shippers became less frightened, and reduced the movement of cattle. Dairy products still continued high.

Under the influence of the extreme heat of the month, summer travel on railroads and steamships is reported as having been the heaviest in years, while the hotels in sections frequented by summer visitors did an excellent business. In the dry goods trade the July business did not come up to expectations, the market having "had to contend with unusually trying weather over the greater part of the country." There was, however, a feeling in dry goods jobbing circles that the crop scares, due to drought, would make the fall season later than usual.

Business was affected during July along many other lines than those already referred to. The number of failures in August was larger than usual, the disturbing influence of the July drought making itself felt during the following month. Building was interfered with, and trade in paints, oils, and other building requisites was checked. Meats were in less demand, and wholesalers in some cases reduced prices in order to move fresh meats in storage. The consumption of milk increased greatly; hence there was a scarcity in many cities, which was partly also owing to the fact that farmers kept their milk for cream instead of running the risk of its souring *en route* to the cities. The demand for ice was so great that there was difficulty in chartering enough vessels in which to ship the ice from Maine. The hot weather was unfavorable for the curing of fish; benefited turpentine farms; increased the sale of fruits and vegetables. And so on.

The examples above given show that excessive heat in some cases curtailed trade, because it kept people at home. In other cases it stimulated trade, because it prompted purchases of summer clothing and vacation supplies. These effects may be classed as direct. Again, in sections where high temperatures were needed for crops, the excessive heat promoted the growth of these crops, and thus induced a healthy feeling and improved business conditions. Or, in other sections where rain was needed, crops or farm produce suffered from drought; the outlook for farmers was poor, and hence trade suffered. Such effects as these latter may be classed as direct.

When the various places from which trade reports were received are divided into two classes, and the prevailing weather conditions are closely studied, it appears that in the majority of cases the key

to the state of trade is found in the weather. Trade is so carefully adjusted to the average weather conditions of any particular month that seasonable weather, other things being equal, usually means seasonable trade. When meteorological conditions are unseasonable, trade is quick to reflect the change. Trade, however, is subject to many and widely-varying controls; hence the problem of the particular controls which affect it in any one week is a very complex one, and the key is by no means always, or sometimes even at all, to be found in local weather conditions. The trade of a city, it must be remembered, is largely dependent upon orders coming from other sections of the country, often at a considerable distance. Hence, although the weather in the city may be unfavorable, and local trade somewhat depressed, orders from the tributary district may suffice to overcome this depression and keep trade up to the usual standard. Again, while a spell of seasonable weather promotes active trade among the inhabitants of a city, the farmers round about take advantage of this opportunity to work in their fields, and trade in the country districts suffers because the farmers are too busy to make purchases. Furthermore, the relation between temperature and precipitation and crops, and hence, indirectly, the control of these elements over trade, cannot be expressed in any simple way. If there has been sufficient rainfall, high, or even unusually high, temperatures may be just what are needed to promote the growth of crops; while, on the other hand, if the rainfall has been deficient, high temperatures may be very injurious. The proper distribution, in time and in amount, of temperature and rainfall in their relation to crops is a subject which still needs careful study.

The effects of the varying weather conditions of July upon the prices of cereals and stocks have been briefly noted. In considering these fluctuations in price it will, of course, be remembered that many reports of damage by, or of beneficial effects of, different meteorological conditions upon crops, and hence upon railroad earnings, are circulated by speculators in their own interest. It is, therefore, often almost impossible to distinguish the real from the speculative damage or benefit. A close study of the conditions of the stock market during July, however, shows pretty clearly that the speculative reports were really based upon facts of some damage, or of some benefit, to crops due to the weather. The real difficulty was that these reports were often greatly exaggerated. With all the speculation which was rampant during the month, many of the fluctuations in prices seem to have had a fairly reasonable foundation in the changing conditions of the weather.

THE POPULATION OF THE UNITED STATES BY SEX, NATIVITY AND RACE.

BY

HENRY GANNETT.

The Census Office has recently published a bulletin giving the classification of the population by the above elements, and the results are of great interest, as showing modifications of the population during the past decade, much of which has been a period of great business depression. Such depressions commonly produce marked effects upon peoples subjected to them.

During the decade from 1890 to 1900, while the total population has increased from 63,069,756 to 76,303,387, or at the rate of 21 per cent., negroes have increased from 7,488,788 to 8,840,789, or at the rate of but 18.1 per cent. The corresponding rate of increase for the white population is 21.4 per cent., and for the native whites 23.3 per cent. The proportion of negroes has diminished during the ten years from 11.9 per cent. to 11.6 per cent. As heretofore, the race is not holding its own proportionally with the whites, although its relative diminution is not as great as in the preceding decade.

The proportion of negroes has increased in many northern States, where they form only a small element of the population; but in all of the southern States, in which they form an element of magnitude, their proportion has diminished, with the exception of Florida, Alabama, Mississippi and Arkansas. The movement of the race appears to have been both southward and northward, involving a notable reduction in the proportion of negroes in the border and south Atlantic States.

The number of the foreign-born has increased from 9,308,091 to 10,460,085—an increase of 12.4 per cent. only, and a reduction in the proportion which their number bears to the total population from 14.8 per cent. in 1890 to 13.7 per cent. in 1900. This result was to have been expected, inasmuch as immigration has been largely reduced during the decade; and while we have no measure of the number of returning immigrants, it must have been large.

Of all the States and Territories eight only show an increase in the proportion of the foreign-born during the decade. These are Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut,

New Jersey, Indian Territory, and Oklahoma. With the exception of the last two all these are northeastern States, lying upon the seaboard. In all the other States of the Union the proportion of foreign-born has diminished.

But the effect of reduction in immigration and the return of immigrants, due to the business depression, was still more marked than this. In no fewer than fifteen States, viz.: Maryland, South Carolina, Alabama, Tennessee, Kentucky, Ohio, Indiana, Michigan, Wisconsin, Iowa, Missouri, South Dakota, Nebraska, Kansas, and Nevada, the proportion of the foreign-born has actually diminished. As will be noted, many of these are States in which the foreign-born element is in great strength. With the exception of Maryland and South Carolina they lie in the interior of the country, most of them being in the upper portion of the Mississippi valley.

The population is distributed as regards sex on almost exactly the same lines as ten years before, the proportion of males being 51.2 per cent. and that of females 48.8 per cent. The distribution of the sexes by States shows only two trifling changes from that in 1890, Connecticut having an excess of males instead of an excess of females, while in Georgia the case is reversed. Nearly all the States of the Atlantic seaboard, as heretofore, contain an excess of females; while west of them the States, in unbroken series, contain an excess of males, such excess being greatest in the Rocky Mountain region.

Among the native-born whites males are slightly in excess, there being 51 per cent. of that sex to 49 per cent. of females. Among the foreign-born the proportion of males is 54 per cent., that of females 46 per cent. The proportion of males in this class shows a slight reduction from that of ten years ago, when it was 55 per cent. The negroes are divided almost equally between males and females, females being in excess to the extent of a fraction of 1 per cent. only.

The Chinese have diminished in number from 126,778 in 1890 to 119,050 in 1900. They have scattered widely over the country, instead of living, as in 1890, almost entirely on the Pacific coast. In 1890 there were in California 72,472; while in 1900 the number in this State had diminished to 38,841.

The number of Japanese has increased from 2,039 to 56,786, 33,905 of which number were in Hawaii.

NOTES ON CLIMATOLOGY.

BY

ROBERT DE C. WARD.

ANTARCTIC METEOROLOGY.—The Great Unknown of Antarctic Meteorology is disappearing. Slowly at first, and then more rapidly, did the meteorological data brought back by South Polar expeditions make it possible to carry the mean annual and mean monthly isobars and isotherms of the earth's surface with greater and greater accuracy to higher southern latitudes. With the elaborate meteorological equipment, which comprises balloons and kites, of the present British and German Antarctic expeditions, and with the co-operation which is planned between these expeditions, it is certain that within the next few years we shall gain in our knowledge of the meteorological conditions in the Antarctic more than has been gained in all the preceding years of Antarctic exploration. This is, therefore, a fitting time to gather up what is now known about the interesting weather conditions of the Far South. In a recent article in *Petermanns Mitteilungen* (1901, 128 *et seq.*), which has been translated in the *Scottish Geographical Magazine* for September (pp. 473–480), Supan considers *Antarctic Climate* in an admirably concise summary, which will be found useful by any one who seeks information on this subject. Supan points out particularly the importance of the results of the *Valdivia* and *Belgica* expeditions. In the *Journal of School Geography* for last May, George D. Hubbard considers *The Meteorological Conditions of the South Polar Regions* in a less inclusive manner. This article, however, sets forth the main facts of note, and points out the importance of the pressure and wind observations in relation to the theory of the general circulation of the atmosphere. In this connection it is well also to call attention to the publication of an *Antarctic Manual*, prepared for the use of the members of the British Antarctic Expedition under the editorship of Sir George Murray, F.R.S. Articles in this volume concern, among other subjects, ice nomenclature, astronomical data, terrestrial magnetism, climate, wave observations, atmospheric electricity, the aurora, geology, volcanic action, ice observations, zoology, botany, sledge travelling, geography and an Antarctic bibliography. The *Manual* contains, in a very condensed form, practically all that is known about the South Polar regions.

The Moon and the Weather.—The relation between the moon and various weather phenomena is a subject in the investigation of which a good many persons have spent a good deal of time without the attainment of noteworthy results. During the past year there has been some revival of interest in this matter because of the appearance of a new journal devoted to the publication of articles on this subject. This journal, *Climat*, is under the editorship of M. Nicolai Demtschinsky, of Torbino, Russia. It is printed bi-monthly, at St. Petersburg, in four languages, viz., English, German, French, and Russian. The practical prediction of the weather for a long time in advance, by means of certain conclusions based on supposed lunar influences, is the topic to which the earlier numbers of this journal were devoted. In Nos. 1 and 2, M. Demtschinsky published a series of curves showing the probable course of the barometer and thermometer at a number of European stations during April. Dr. H. R. Mill, in *Symons's Monthly Meteorological Magazine* for May, made a careful comparison of the predicted and of the actual weather conditions at Aberdeen and Valencia. This, so far as we have seen, is the only published comparison of prediction with fact of observed weather. Dr. Mill found, as was to be expected, that "practically the forecasts as a whole would appear to be valueless," so far at least as those two stations are concerned. It is unlikely that *Climat* will live long, or that it will receive much attention from men of science.

Hot Waves.—A report on hot waves in the *Yearbook of the Department of Agriculture* for 1900 is of special interest at the present time, in view of the excessive heat of last July. A study of three notable hot spells is illustrated by maps showing the distribution of pressure and temperature over the continent during these spells. The conditions are fairly similar in each case, viz., an area of moderately high pressure in the sub-tropical region to the southeast; an area of moderately low pressure in the north central States, and a second area of high pressure on the west or northwest coast. A slow flow of air results from the southeastern anticyclone to the central cyclone, and the extreme temperatures occur between these two regions. The intense heat is due largely to the clear sky, which allows a very free passage of insolation. The radiation at night seems to be slight; and this is stated to be due to the presence of much transparent water vapour in the higher strata of the atmosphere, which checks the outward passage of the coarse-waved terrestrial radiations.

A New Text-Book of Meteorology.—The latest text-book of meteorology, which was published early in the summer, is by Dr. Börnstein, professor in the Royal Agricultural High School at Berlin (*Leitfaden der Wetterkunde*). Within the limits of 156 octavo pages, the author has given an excellent presentation of his subject, in such a way that beginners may read his book with profit. The most important recent developments of the science, so far as they lie within the limits set for himself by the author, are included. Thus, for example, the noteworthy conclusions reached by Pettersson and Meinardus concerning seasonal forecasts for Europe based on certain characteristics of the Gulf Stream, and the meteorological results obtained during recent balloon ascents, are considered. The chapter on weather is particularly complete. The weather types of Köppen and van Bebber are explained, and numerous weather maps are given as illustrations. The book shares with most German text-books the great disadvantage of having no section headings. There is a good working bibliography, mostly confined to German publications, and nine colored plates, reproduced from the International Cloud Atlas, illustrate the cloud types.

Lorin Blodget.—Lorin Blodget died in Philadelphia on March 24 of the present year, at the age of 78. Blodget's name is not commonly known to the younger generation of scientific men in this country, but his writings on meteorology entitle him to a place among those who have contributed to the development of this science in the United States. Blodget's interest in meteorology began when he was about twenty years old. He became a voluntary observer of the Smithsonian Institution, and was later employed by Professor Joseph Henry in reducing meteorological records. In 1857 Blodget published his great work on the *Climatology of the United States*—a book which has for many years been out of date in its statistical portions, but which nevertheless contains a good deal of general information about the larger climatic features of the country that is still useful. This *Climatology* is a book of 536 pages, and contains a large number of tables and charts. Some idea of the wide field which the author intended his work to cover may be gained from the title, which is as follows:

"Climatology of the United States, and of the Temperate Latitudes of the North American Continent. Embracing a Full Comparison of these with the Climatology of the Temperate Latitudes of Europe and Asia, and especially in regard to Agriculture, Sanitary Investigations and Engineering. With Isothermal and Rain Charts for each Season, the extreme Months, and the Year. Including a Summary of the Statistics of Meteorological Observations in the United States, condensed from recent Scientific and Official Publications."

MAP NOTICES.

BY

HENRY GANNETT.

Since our last notice, the United States Geological Survey has published thirty-one atlas sheets. Of these, one only, Old Forge, is in the State of New York. This, on a scale of 1 : 62,500 in 20-foot contours, is in the Adirondacks, and represents a lacustrine region, with irregular mountains, hills, swamps, and crooked winding streams showing glacial topography, with a general northeast and southwest trend.

The Camden sheet, on a scale of 1 : 125,000 and a contour interval of 20 feet, is comprised mainly in New Jersey, but includes a portion of southeastern Pennsylvania; the city of Philadelphia being in the northern portion of the sheet.

The Chestertown sheet, on a scale of 1 : 62,500, with a contour interval of 20 feet, lies in the northeastern part of Maryland, being on the east shore of Chesapeake Bay. It shows a low country, rising scarcely 60 feet above tide, with many drowned valleys.

The Columbia sheet, on a scale of 1 : 125,000 and a contour interval of 50 feet, lies in the western part of Tennessee, and represents a hill country maturely dissected, with winding streams slightly incised.

In Iowa are two sheets on a scale of 1 : 125,000, with a contour interval of 20 feet. These, Peosta and Stanwood, in the eastern part of the State, represent a rolling country somewhat dissected, especially in the neighbourhood of the Mississippi River.

In Indian Territory there are twelve sheets, all on a scale of 1 : 125,000, with a contour interval of 20 feet. Five of these, namely, Claremore, Muscogee, Nowata, Pryor, and Tahlequah, lie chiefly in the Cherokee Nation, and represent in the main a country of low relief, although in the eastern parts of Muscogee and Pryor the country rises into the dissected plateau known as the Boston Mountains, which are, in fact, the western portion of the Ozark plateau. Stonewall, Tuskahoma, Alikchi, and Antlers lie mainly in the Choctaw Nation. On these sheets is represented a portion of the crooked ridges of the Ozark hills in the Territory. The Denison sheet lies in part in the Chickasaw Nation and in part in northern Texas, and represents a country of low relief with the broad

bottom land of Red River, over which that vagrant stream wanders at will. Two sheets—namely, Addington and Tishomingo—lie entirely within the Chickasaw Nation, and represent a country with little relief.

In Wyoming are three sheets, all on a scale of 1 : 125,000. Newcastle sheet includes the portion of the Black Hills in the eastern part of the State. The Dayton sheet represents a part of the Big Horn Mountains near the northern boundary and the plains at their base. The "Rimrock," as the high hogbacks on this range are called, is admirably illustrated on this sheet. The Grand Teton sheet includes most of the Teton Range and Jackson Hole.

In Montana is one sheet, Hamilton, on a scale of 1 : 125,000, with a contour interval of 100 feet. This sheet represents the eastern front of the Bitter Root Mountains, with the divide of the range and the valley of Bitter Root River at its eastern base. Glacial amphitheatres, lakes, hanging valleys, and gorges are admirably illustrated on this sheet. The straight courses of the present streams in their glacial gorges are due to their extremely high grade. The divide has been cut back from the front of the range to its present position, leaving the highest summits, as a rule, upon the spurs.

Sand Point lies in northern Idaho, and represents a mountainous country with portions of two great glacial lakes, Priest and Pend Oreille, with a portion of Clark Fork flowing out of the latter lake.

In Washington are six sheets, all on a scale of 1 : 125,000, with a contour interval of 100 feet. Spokane lies in the eastern part of the State, showing in the eastern part foothills of Rocky Mountains, and in the western part a level lava plain in the eastern portion of the Great Columbia Plateau. The other sheets—Methow, Ellensburg, Chelan, Stilaguamish, and Glacier Peak—are all in the Cascade Range, the first three being upon its eastern and last two upon its western slope. Methow and Chelan include portions of Lake Chelan, that great gorge of an extinct glacier. Ellensburg lies farther south, and includes the lower slopes of the range. Glacier Peak includes a high mountain region about the snmmit of the range and shows many small glaciers. Glacier Peak, with an elevation of 10,436 feet, is entirely surrounded by ice. The entire region represented on this sheet is extremely steep and rugged. Stilaguamish lies west of the latter, and includes a portion of the western slope of the range, comprising the valley of Sauk and Stilaguamish rivers, with heavy, broad mountain spurs separating them.

In California are two sheets, both on a scale of 1 : 125,000, with

a contour interval of 100 feet. Mount Lyell sheet represents a portion of the summit of the Sierra Nevada, extending on the east to Mono Lake and on the west nearly to Yosemite Valley. This region throughout has been carved by glaciers, and presents examples of nearly all phenomena of glacial erosion, including U-shaped gorges, hanging valleys and amphitheatres, with their accompanying lakes and bare granite slopes not yet covered with soil (for the occupation of this region by ice has been very recent), while upon the high mountains small glaciers still remain. Altogether this is one of the best sheets for illustration of glacial phenomena which has been produced. The San Luis Rey sheet lies in southern California, upon the Pacific coast, and represents a country of irregular hills and intermittent streams—for it is an arid region. The mouths of the streams flowing to the Pacific have been closed by the deposit of sand from the currents along the coast, so that their only outlets are by percolation through the sand-bars.

The *Annales de Géographie*, Tome X, 1900, contains an article by Monsieur L. Gallois on the Andes of Patagonia, accompanied by a map in three sheets showing the breadth of South America south of south latitude 39°. This map bears the following title: Carte de la Partie Méridionale de la République Argentine, d'après les documents de la Commission Argentine des Limites avec le Chili et du Musée de la Plata par F. P. Moreno, Expert Argentin et Directeur du Musée. The scale is 1:1,500,000. Water bodies are printed in blue, culture and lettering in black, and relief is expressed by brown crayon work.

This map represents the Andes chain within the South Temperate Zone, with the Atlantic and Pacific slopes.

The mountains have been extensively glaciated, as shown by the existence of many lakes and the irregularities of the streams. Indeed, in numerous localities glaciers of magnitude still exist. One interesting feature in connection with this country is the fact that the westward-flowing streams have eaten their way across the divide to the eastward, in many cases to considerable distances, and this fact has given rise to contention between Chile and Argentina concerning the proper location of the international boundary, one party contending that it should follow the water divide, the other that it should follow the crest of the highest land.

As this map represents recent and extensive explorations and surveys it is probable that it will induce much correction in the general maps of this region.

GEOGRAPHICAL RECORD.

AMERICA.

PEARLS IN AMERICAN WATERS.—The Consular Reports (June, 1901) said that the Government of Colombia had decided to sell the exclusive right, for fifteen years, to work the pearl fisheries in the Gulf of Panama. The small group of islands, consisting of Del Rey, San José, Pedro Gonzales, and many islets, about fifty miles southeast of Panama, have been famed for more than a century for their yield of pearls and coral. Many pearls of great value have been found by divers working at seasons of the year when the water is unusually clear. It is not common, of late years, to make very valuable finds, though pearls of great worth sometimes reward the fishermen. About two years ago a boy, while diving in shallow water, found a pearl, which he sold to a local dealer for a sum equal to $1,760. It is now for sale in Paris, an offer of $6,000 for it having been refused. The yield of pearl-shell (mother-of-pearl) is of considerable importance.

The fishing-grounds of Margarita, off the north coast of Venezuela, contributed for centuries to the world's supply of pearls. The industry has been almost abandoned in recent years, as the banks seem to be about exhausted. Our Consul at Caracas writes that the past few months have witnessed a wonderful revival of the industry. About 2,000 natives and 400 sailing vessels are engaged on the northeast and northwest shores of the island. In July last the value of the output this year was estimated at about $600,000. The pearls are of fine quality and beautiful lustre. In May last a large white pearl was sold for $1,700. Most of the pearls are sent to Paris, as that market, on the whole, offers the best price for them.

ATTRACTING GOLD DUST.—Mr. L. Gentil Tippenhauer, whose reports on his geological investigations in Haiti have been printed in *Petermanns Mitteilungen*, tells this remarkable story (No. VIII, 1901):

In conclusion, I will mention a most unusual phenomenon. As I was engaged in making microscopic studies of the gold-bearing river sands, I observed that the thirteen-year-old daughter of my companion, L. Aboilard, had only to thrust her hand into the sand and gold dust would cling to it. Every time she did this the gold remained on her hand. When she shook her hand the sand fell to the ground, but the flakes of gold remained. No other person possessed this peculiarity. The

phenomenon has since been attested by the educated Europeans in Jacmel; also by Dr. Zervas, geologist and representative of the Standard Oil Company and other gentlemen. The numberless particles of iron in the sand did not remain in the girl's hand. I must, therefore, draw the conclusion that there is in nature a power which has an influence upon gold similar to that which magnetism exerts upon iron and related minerals. The daughter of Mr. Aboilard seems to have this power.

MANUFACTURES IN RHODE ISLAND.—The census statistics of Rhode Island's manufacturing industries are of special interest, because they are the first data yet printed relating to the industrial progress of any of our great manufacturing States in the past decade. In the census year 1900, 22.5 per cent. of the entire population and in the busiest season of the year, 27.5 per cent., or 117,986 persons, were engaged in manufacturing. The growth of manufacturing industries has made steady progress for fifty years, in which time the average number of wage-earners employed has increased 364.4 per cent., while the growth of population has been only 190.5 per cent. The capital invested increased about $57,000,-000 in the past decade, being $183,784,587 in 1900. The number of establishments grew from 3,377 in 1890 to 4,189 in 1900. The textile industries are by far the most important. They give employment to 51 per cent. of the wage-earners, and the value of the product is 42.4 per cent. of the total value of all the products of the State. Jewelry is the second most important industry, the product being valued in 1900 at $13,320,620, which is 66.3 per cent. more than in 1890, when one-fifth of the jewelry of the country was manufactured in Providence. Machinery is the third most important industry. The three cities pre-eminent in manufacturing are Providence, Pawtucket, and Woonsocket, whose output in 1900 amounted to $127,876,764, or 69 5 per cent. of the total product of the State.

EUROPE.

COAL IN THE NETHERLANDS.—The Dutch have long bought from foreign countries, mostly England and Germany, about all the coal they consume. The fact that they have produced little coal at home has been prejudicial to the large development of their industrial interests. The southern part of Limburg, in the extreme southeastern part of the country, is the only region where coal-mining has been carried on. It is reported in *Petermanns Mitteilungen* (VIII, 1901) that there is now every likelihood of a large development of coal-mining in that region in the near future. The investigations of the past decade have revealed large deposits. The product at present is only 1,200 tons a day, but there seems

to be no reason why the yield should not be increased to 10,000 tons a day. Whether these mining interests remain in the hands of the State or are turned over to private companies the prospects are that in time the Netherlands will produce nearly, if not all, the coal which the country requires.

Russian Anthropology.—The *Scottish Geographical Magazine* (Sept., 1901) says that M. Zaborowski has made a study of the skulls collected in differents parts of Russia and Siberia by M. le Baron de Baye, and has been able in consequence to clear up several obscure points in the history of the human race. He has pronounced against the old theory that the earth was peopled from the north, and that the cradle of the race was in Siberia; he has demonstrated that the central regions of Asia were already inhabited when Siberia was still one enormous glacier. He has also proved that the Finns from the north colonized Russia, though so lately and so slowly that the Caucasus is still almost entirely populated by Turks or Mongolians. He points out that one skull, which is curiously covered with red powder, has the same characteristics as other very old ones found in caves near Mentone, France, which leads to the conclusion that at some far distant time one race inhabited the whole of central Europe.

Studying European Fisheries.—The representatives of eight Governments attended a conference at Christiania in May last, when plans were adopted for the scientific study of the fisheries along the coasts of northwest Europe. The proceedings were conducted on the understanding that the investigations are to be carried out strictly with a view to practical results as regards fisheries. The field embraces all the great cod, herring, and mackerel grounds of northwest Europe and the inshore fisheries, including the oyster beds. The biology of food fishes will be studied; the Conference urged the importance of ascertaining the distribution of fish and fish food with sufficient detail to permit the drawing of charts. While special areas of research have been assigned to each nation, none is to be excluded from extending its studies beyond the allotted territory. Several of the countries are building special vessels to carry on their share of the researches. The allotment of the spheres of work is as follows:

From 58 degrees to 62 degrees north the investigation of the North Sea and North Atlantic will be shared by Great Britain, Norway and Denmark, while the North Atlantic further north and the Arctic Sea will be investigated by Norway and Russia. The Skagerrak and Kattegat are assigned to Norway, Sweden, and Den-

mark; the western Baltic to Germany, Sweden, and Denmark; the southern part of the eastern Baltic to Germany; and the northern part, including the Gulfs of Finland and Bothnia, to Sweden, Russia, and Finland. Great Britain will attend to that part of the North Sea lying south of 58 degrees north and west of 2 degrees east; while Belgium, Holland, Germany, and Denmark will be responsible for the sea lying off their own shores.

Retirement of Professor Suess.—The seventieth birthday of Professor Eduard Suess, the distinguished geologist of Austria-Hungary, was celebrated on August 20. At the end of the last semester of the University year he retired from the chair of geology in the University of Vienna, after a service of thirty-five years. In the course of a half century he has contributed voluminously to the literature of his scientific specialty, but nearly all his studies and writings were preparatory to the production of his great book, *Das Antlitz der Erde* (The Face of the Earth), which he was over eight years in writing. Professor Suess, of course, did not originate the theory—which he holds with many other geologists—that the elevations and depressions of the rock surfaces are due primarily to the cooling and consequent shrinkage of the earth's crust, which results in the breaking of the strata and the uplifting or folding of the rock masses. The distinctive merit of his work is that never before was so vast an array of evidence adduced tending to substantiate the correctness of the theory; and never before were proofs of its accuracy carried so far. As Dr. Wichmann, of Gotha, has said of him: Suess was a road-breaker, and the future investigation of the problems he treated must always take into account the way he made for himself and for the specialist who will come after him.

ASIA.

Exploration of the Aral Sea.—The *Verhandlungen* of the Berlin Geographical Society says that the Turkestan section of the Imperial Russian Geographical Society having commissioned Mr. L. B. Berg to explore the Aral Sea, he organized a party, and with difficulty transported a sail-boat, ten metres long, to Kasalinsk, on the Syr Daria river, whence the expedition started on June 16, 1900, for the delta of the river on the north-east coast of the sea. Topographer Moltschanow remained here on the low island Kossaral for two months, making an excellent map of the whole delta with the neighbouring parts of the coast. On June 25 the expedition put out into the sea, and visited the large and still little-known islands Barssa-Kelmess and Nikolai, in the central part of it, land-

ing on June 28 on the steep west coast which forms the eastern edge of the desolate Ust-Urt plateau. Geological collections were made in the Ust-Urt, and the coast was then skirted to the north as far as the Kai-kubek Mountains, which jut out into the sea on the northwest side. Thence the expedition sailed straight across the sea to the Menschikow island, between the mouths of the Syr Daria and the Amu Daria, in order to ascertain the depths in the middle of the sea. In August Mr. Berg investigated the sea life, many specimens—both animal and vegetable—being collected. Meteorological observations were carried on daily for three months. The depth in the middle of the sea was from twenty to twenty-three metres, the maximum depth (62.3 metres) being found not far from the steep slope of the west coast. The waters are characterized by low salinity and unusual transparency, objects being clearly visible 20.5 metres below the surface. There were numerous indications of a rapid rise in the level of the sea, which is all the more remarkable because all travellers from 1820 to 1880 reported that the tendency was towards desiccation. High-water marks, which Berg recorded on the rocks, will in future be helpful in ascertaining the variations of sea-level.

Dr. Hedin's Second Expedition in Central Asia.—Dr. Sven Hedin is expected to complete this year his second series of explorations in Central Asia. He will probably not be able to return to Europe until next spring, about three years after his departure. A long account of his work up to April 23d last has been received in Sweden. Earlier letters had brought the news that he had travelled down the Yarkand and Tarim rivers to the Lob Nor region, where he discovered an ancient lake-bed, which strongly confirmed his theory that the ancient Lob Nor was not identical with the lake that now bears that name.

The work he accomplished later, up to April 23d last, was (1) to survey the mountains south of Lob Nor, in northeast Tibet, as far as the westerly Kum-Kul ranges. Most of his work there was in unknown country, but he spent only a month in this field; (2) from a point east of Lob Nor he crossed the Gobi desert straight to the north, passing through the mountainous region which is the western extension of the Kurruk Tagh, and found the existing maps quite incorrect. Water was very scarce and the camels would have succumbed if snow had not been found; (3) the ruins on the north shore of the ancient lake-bed of Lob Nor were then visited and carefully studied. The discoveries

made here were numerous and important. Among them were twelve letters in Chinese in an excellent state of preservation, a Buddhist temple in which artistic wood carvings were found, and other remains of a civilization that probably dated back at least 800 years.

Dr. Hedin wrote that he had gathered material sufficient for a large volume on the Lob Nor problem alone. He had already compiled 726 sheets of maps. He hopes to be able to publish a large atlas of sixty to seventy maps on a scale which will permit him to show all details. He proposes to publish the scientific results of all his geographical, geological, and hydrographical studies in two large volumes of 500 pages each, which will form the text to the atlas. It is his desire, also, to print a popular account of his work in two volumes of moderate size.

He found that the water from the present Lob Nor is beginning to flow back into the ancient bed.

When he wrote he expected to start in eight or ten days from Charkhlik, a little south of Lob Nor, on the last stage of his great journey. He intended to cross Tibet diagonally, following a generally southwest direction, to the sources of the Indus river. As he travels slowly and maps carefully he expected that this march would occupy the rest of this year. If possible he will visit Lord Curzon in Calcutta and then return to his caravan in order to conduct his men back to Kashgar, whence he will come home with his large collections.

AFRICA.

Major Gibbons's Explorations on the Upper Zambesi.—Major Gibbons, holding the correct view that the time for long journeys of exploration in Africa is past and that he could render most service to geography by choosing a comparatively small territory and carefully exploring it, selected the territory of the Upper Zambesi for his expedition of 1898–1900, and not only surveyed the entire course of the upper main stream, but also its eastern and western tributaries and much of the land between them. He returned home with detailed material for mapping the region to which he confined his attention. (*Geographical Journal*, *Feb.*, 1901.)

The Jeppe Map of the Transvaal and the Surrounding Territories.—*Petermanns Mitteilungen* (1901, No. VIII., p. 124) says that the map house of Wurster, Randegger & Co., of Winterthur, Switzerland, lithographed and printed for the Boer Government of the South African Republic the official map of that coun-

try, drawn by Frederick and C. F. W. Jeppe in the office of the Surveyor General at Pretoria. The map, in six sheets on a scale of about eight inches to the mile, is the best and most detailed map yet made of that part of Africa. The printing having been completed a short time before the war began, the edition was kept at Winterthur by order of the Transvaal Government, with strict injunctions not to permit it to get into circulation. It is asserted, however, that a copy of the map found its way into the hands of the British, who made it the basis, last year, of the military map issued by the Intelligence Division of the British War Office. The British map was evidently produced from a photographic enlargement of the Jeppe map. It omitted many details of the Jeppe map, such as were not serviceable for military purposes. The original map, which is now being circulated, shows better than anything else the Transvaal as it was before its people were scattered, its farms wasted, and its prosperity destroyed.

Death of an African Pioneer.—The Rev. J. Erhardt, who was well known to all geographers of the last generation, died in Stuttgart on August 14, aged 78 years. The contribution he made to the modern exploration of Africa was as valuable as it was unique. He was the companion of Rebmann and Krapf, the missionaries who founded their station near the port of Mombasa, now a part of British East Africa. Rebmann discovered Kilimanjaro, the highest mountain in Africa, in 1848; and Rrapf revealed Kenia, the second highest mountain, in 1849. While his companions were exploring the unknown interior, Erhardt's talent for linguistic studies led him to devote all the time he could spare from his missionary work to the task of mastering the coast languages, in which he became very proficient. In the course of a few years he collected the testimony of hundreds of Arabs, Swahili and others, with regard to a great lake, far inland, which was so wide that they could not see across it, and extended for hundreds of miles north and south. By collating many reports he obtained a rough idea of the distance of the lake from the sea in different latitudes; but in all the stories he sifted he did not hear of more than one lake, the fact being that some of the information related to Victoria Nyanza, some to Tanganyika, and some to Nyassa. His first report on the great lake appeared in the *Church Intelligencer* in 1855; and in the following year his exhaustive analysis of the evidence he had gathered, proving the existence of a lake, and the tentative map he had prepared of it, were published in *Petermanns Mitteilungen* and

in the *Proceedings* of the Royal Geographical Society. His map showed an enormous sheet of water extending from the region of Victoria Nyanza to that of Nyassa. Though he showed only one enormous sheet of water, later discoveries proved that he indicated the general position of the lake region with approximate accuracy. The information he had laboriously gathered was received with much incredulity; but his map was the final, decisive influence that led to the fitting out of the expedition of Burton and Speke, who discovered Victoria Nyanza and Tanganyika, Livingstone a little later adding Nyassa and Bangweolo to the maps, and thus completing our general knowledge of the great lake region.

NOTES ON COMMERCIAL GEOGRAPHY.

France received, in 1894, 7,500 pounds of tea from Annam, the first tea imported from one of her colonies. The importations in 1899 amounted to about 140,000 pounds. It is believed that Annamese tea will, in time, fill the entire demand of France. The French assert that it is equal to the finest article exported from China. The crop is increasing every year. Up to 1892 Annamese tea was cultivated only for use among the natives. It is now used by all the French soldiers in Annam, and colonists are going into the business of tea-raising, finding it more profitable than any other crop. Natal is also becoming known as a producer of tea. The industry, yielding 400,000 pounds in 1899, is rapidly growing. The planters have high hopes of soon entering the foreign markets with good teas grown much nearer the great consuming countries than the present sources of supply. South Africa is the market as yet for all the tea raised.

MM. Bernard and Lacroix, in their *Historique de la Pénétration Saharienne* (Algiers, 1900), expressed the opinion that the Sahara is of little value. The trade between the Sudan and northern Africa has been much over-estimated, is scarcely 10,000,000 francs a year, and, according to official reports, is decreasing in value. They think that the railroad from Algeria to Lake Chad must be built, as a military and political necessity, but express doubts that it will be of much commercial value. M. Honoré, in his *Le Transsaharien et la Pénétration Française en Afrique* (Paris, 1901), expresses practically the same view. He says that the present trade of the Sahara, including that which passes across the desert between the Sudan and the north coast, amounts to only about 11,000,000 francs a year, and is decreasing, first, because slave imports to the Mediterranean states have largely ceased, and also because the ports on the

Atlantic coast of the Sudan are offering more and more competition for the control of the Sudan trade. Of the European wares, valued at 200,000 francs, imported to Timbuktu in 1899, only 20,000 francs' worth came by the desert route, the balance being imported through Atlantic ports.

The experiments of our Department of Agriculture seem to prove that Egyptian cotton may be grown with success in the dry, hot regions of our Southwest where irrigation is possible. The experimental farm near Phœnix, Arizona, produced fine Egyptian cotton this year from seed brought from the Nile; this variety of cotton will be planted next year in a number of places in Arizona and New Mexico, where the conditions under which the Nile crop is grown are practically reproduced. Three-fifths of the cotton we now import comes from the Nile delta, our imports from Egypt in 1900 amounting to about $5,000,000. The Egyptian fibre is the longest of the cotton staples, except Sea Island. Mixed with American upland cotton it is regarded as indispensable in some branches of our manufactures. It is also used as a substitute for Sea Island, for fine goods where strength and lustre are essential.

Ten years ago the total tonnage of the vessels entering and departing from Hamburg, Rotterdam, and Antwerp was far below that of the shipping tributary to London. In 1899, however, the commercial movement of these three ports reached a total of 21,000,000 tons; while that of London was only 15,200,000 tons. The tonnage movement of the four ports is gaining every year, but that of London is far less than that of the other ports. The gain of 1899 over 1898 was 591,679 tons for Rotterdam, 426,666 for Antwerp, 411,832 for Hamburg, and only 100,776 for London. The main cause of the rapid growth of the commerce of these Continental ports, while that of London is increasing but slowly, is the fact that Rotterdam, Antwerp, and Hamburg have been widely extending their steamship connections with various parts of the world, thus having direct connections with many ports whose commerce with them formerly passed through London, which was a receiving and forwarding station for their trade of much larger importance than it is now.

POLAR REGIONS.

PEARY'S WORK IN 1900–1901.—The New York *Sun*, of September 14, published the following letters:

NORTH SYDNEY, C. B., Sept. 13.—The Arctic steamship *Erik*, from Cape Sabine, Ellesmere Land, reached this port to-day. Everybody on board is well. We left Mr. Peary at Herschel Bay Camp on August 29. He had succeeded in rounding the

northern limit of the Greenland archipelago, the most northerly known land in the world, probably the most northerly land. He expects to spend the winter at Cape Sabine and push north toward the Pole in the spring.

Mr. Peary reached the *Windward* at Payer Harbour, on which we, his family, had been for eight months imprisoned in the ice, at dawn on May 6. He came just as he did to the *Kite*, nine years before, from his inland ice march. For eight months, ignorant of each other's presence, we had been within 250 miles of each other, Mr. Peary at Fort Conger and at his meat caches fifty miles west in the Lake Keazen country and the *Windward* and our party at Payer Harbour, a mile or so south of Cape Sabine, where we were finally stopped at the end of August, 1900.

Mr. Peary brought us first news of his great march of a year before, which took him over the most northerly land of the globe to the highest latitude ever gained by an American, along an unknown coast 160 miles beyond Lockwood's farthest north. Mr. Peary finally and accurately defined the northern coast of Greenland, all the way round to Independence Bay, where he had planted his country's flag nine years before.

Mr. Peary, with Matt and five Esquimaux, left Etah on April 15, 1900, and on May 8, having in the meantime sent back, in parties of two each, four of the natives, opened Lockwood's, furthest north (83° 30′ 25″) cairn of 1882 and substituting matter of his own, pushed forward with Henson and the other Esquimaux, to 83° 39′, where he found that the coast turned sharply to the eastward. Striking out due north from this point for the Pole, he was able to advance but a short distance to 83° 50′ before he met the moving disintegrated pack, a mass of broken ice and open water, which made further progress in that direction impossible.

Returning to the land he resumed his eastern march along the coast, and continued it until at about 83° N., 25° W. he recognized the lofty headland which, in 1892, he had seen from Navy Cliff, at the head of Independence Bay. There he rested for two days, waiting in vain for fog to lift and reveal further features of land and sea, but, unfavorable conditions continuing, he laid his homeward course along the outward track and arrived at Fort Conger on June 15, with men and dogs in good condition.

Mr. Peary sends full and carefully-detailed chart of his newly-discovered country to the Peary Arctic Club, with the suggestion that nomenclature and publication be deferred until completion of his work and return home.

The new coast shows marked change at the farthest north, and the bold headlands and deep fiords are succeeded by a low, rolling foreshore, with traces of glacial action and all the evidences of a continental terminal coast. The likeness of this Greenland coast to that of Grinnell Land west of Cape Hecla is marked and points clearly to similar conditions of land and sea, and suggests that it is the littoral of the true Arctic basin.

Musk oxen, bear, lemming, and hare were killed, and a wolf seen and fired at in the new country, and indications of animal life, isolated probably from southern latitudes, were abundant. In Mr. Peary's farthest north cairn he placed portions of the flag of his country, and his private signal, and the names of the Peary Arctic Club members, under whose auspices the work was prosecuted. Temperature of the journey ranged from −40° to 20° above.

The remainder of 1900 and the first month of 1901 were spent by Mr. Peary, with Fort Conger as a base, in preparation for his advance on the Pole by way of Cape Hecla, the only remaining available route. The start from Conger, with the same force, was made on April 15, exactly a year from the departure of the south Greenland expedition; but ten days in the field demonstrated that men and dogs were not in fit condition, and that it would be hazardous, if not hopeless, to proceed. Mr.

Peary, therefore, decided to return to Fort Conger and begin immediately work on an expedition for the spring of 1902, his first step being a trip southward to learn, if possible, what he might depend on regarding the auxiliary ships of 1900 and 1901.

Four busy months followed. The *Windward* broke out of the ice on July 3, and, after a month's successful work in Inglefield Gulf, among the walrus, of which 125 were killed and landed at Brumt Island, was joined on Aug. 4 by the *Erik*, the auxiliary of 1901. The total walrus score of both ships is 180, or about ninety tons of food for men and dogs, which, with meat and skins of forty deer, are already available for next spring's work.

Mr. Peary has established his headquarters for the winter at Payer Harbour, where the *Windward* was icebound. Heavy ice from Kane Basin prevented the *Erik* from reaching the new base, and after four days of vain and arduous effort, Mr. Peary and his party, including his faithful Esquimos, with their lighter supplies, were disembarked at a temporary camp in Herschel Bay, ten miles south, on Aug. 29, whence he expects in a few weeks to transfer all to his permanent base, not more than ten miles distant.

The *Windward*, with Messrs. Stein and Warmbath as passengers, is following us, but neither ship has news of the *Fram*.

Our winter on the *Windward* was monotonous, but comfortable, our coldest being but 40 degrees below. Once we had a close call by "rafting" ice, threatening to drive the *Windward* on the rocks, but the ship righted herself on the next tide. No serious illness, accident, or mishap of any kind has befallen any of the parties in the field or on ship, and my husband, at our parting at Herschel Bay Camp on Aug. 29, was in the best of health, and full of confidence that he will succeed in the task which he has set for himself for next spring. My purpose now is to rejoin him in the *Windward* at Cape Sabine in August next and return with him to the States.

JOSEPHINE DIEBITSCH-PEARY.

Mr. Peary's letter to H. L. Bridgman, President of the Peary Arctic Club, which Mrs. Peary refers to, is in part as follows:

"CONGER, April 4, 1901.

MY DEAR BRIDGMAN:

It gives me great pleasure to present to the club the results of the work of 1900:

(1) The rounding of the northern limit of the Greenland archipelago, the most northerly known land in the world, probably the most northerly land.

(2) The highest latitude yet attained in the western hemisphere (83 degrees, 50 north).

(3) The determination of the origin of the so-called paleocrystic ice (floe berg), etc.

Considering that I am an old man, have one broken leg, and only three toes, and that my starting-point was Etah, I felt that this was doing tolerably well. It is almost a thousand years since "Erik the Red" first sighted the southern extremity of the archipelago, and from that time Norwegians, Dutch, Danes, Swedes, Englishmen, Scotchmen, and Americans have crept gradually northward up its shores, until, at last, through the instrumentality and liberality of the club, its northern cape has been lifted out of the Arctic mists and obscurity. It seems fitting that this event, characterized by Sir Clements Markham as second in importance only to the attainment of

the Pole itself, should fall in the closing year of the century. If I do not capture the Pole itself in this spring's campaign, I shall try it again next spring.

My gratitude and respects to all the members of the club.

Always most sincerely,

PEARY.

Dr. Dedrich takes this letter south, to be sent by natives to Cape York, thence by whaler to the British Consul at any civilized port."

Mr. Peary also sends to the club a complete and detailed chart of his newly-discovered coast and other work.

Peary's Reconnoissance of the Greenland Inland Ice, in 1886,* was the beginning of the work now happily terminated. From that beginning, with repeated interruptions imposed upon him in the discharge of duty, he has steadily adhered to his plan of exploration from different points of the Baffin's Bay and Smith Sound coasts, to fill out the coast-line, fix its northeastern limit, and complete our knowledge of Greenland. No man has better deserved success, and he might well have turned his back upon the Arctic this year with the consciousness of a great task worthily accomplished, but for his sense of loyalty to the friends who have pledged their support to him for a period not yet expired. He will do what energy and judgment and experience can do to reach the Pole, and it is characteristic of Peary to promise nothing and to perform much.

NOTHING IS KNOWN of the *Fram*. In August, 1899, when the *Fram* came to Etah, her navigator told Mr. Peary that she was going into Jones Sound, if possible. A week or so later the *Fram* was seen out in the ice, just off Etah.

The natives report that she went south between the *Diana* and the *Windward*. They knew her because the *Diana* and the *Windward* were black, while the *Fram* was white.

In all the travelling between Etah and Fort Conger and beyond, during the winter and spring of 1899–1900, and the winter and spring of 1900–1901, nothing was seen or heard of the Norwegians or their ship.

Judging by the ice conditions from Fort Conger down to Cape York, during 1900 and 1901, the *Fram* would not be able to get out of Jones Sound this past summer.

DR. ROBERT STEIN, who returned in September with Mr. Warmbath from their two years' sojourn in Ellesmere Land, published an account of his experiences in the *New York Tribune* of September 29.

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* See *Journal* of the Am. Geog. Soc., Vol. 19, pp. 261–289.

He and his two companions had planned an exploration of the western shore of Ellesmere Land. This was found to be impracticable; and in the spring of 1900 Dr. Stein and Dr. Kann started for Upernavik, but got no farther than Cape York. Here, on the 9th of June, three Scotch whalers put in and furnished Dr. Stein with supplies. Dr. Kann returned to Dundee in one of the whalers, and Dr. Stein lived with the Eskimos at Cape York until the arrival of the *Windward*, which took him on board and landed him at the end of August at Payer Harbour. With a year before him Dr. Stein still hoped to do some exploration, but inferring, he says,

from additional facts gathered, that Sverdrup had almost certainly done all the work within reach of our limited means, I thought it best to devote my time to the study of the Esquimau language, and, later on, to a detailed plane-table survey of Payer Harbour.

CAPT. BAUENDAHL, who wintered at Danes Island, Spitzbergen, has given up his original plan of pushing toward the Pole by the Franz Josef Land route. *Petermanns Mitteilungen* (Band 47, VIII.) learns from Tromsö that he is building a two-masted vessel, 26 feet long and 4 feet deep, in which, with two men and provisions for two years, he will drift as nearly as he may to the east coast of Greenland and from there press to the north.

CAPT. STÖKKEN returned to Sandefjord, Norway, on the 11th of August, from his expedition to Franz Josef Land to look for the three missing men of the Duke of the Abruzzi's party—Count F. Querini, H. Stökken (son of Capt. Stökken) and the Alpine guide, F. Ollier. The whole southern coast was searched in vain, and Capt. Stökken performed the melancholy duty of erecting at Cape Flora a memorial stone bearing the names of the lost men.

THE BALDWIN-ZIEGLER POLAR EXPEDITION left Tromsö July 17, and Archangel a week later, for Franz Josef Land. Mr. Baldwin has published, in *McClure's Magazine* for September, an account of his equipment.

He has three vessels: the *America*, a three-masted ship-rigged steamer of 466 tons burden, driving a single screw; the *Frithjof*, a sailing vessel of 260 tons; and the *Belgica*, well known as the ship of the Belgian Antarctic Expedition. He takes 400 dogs, 15 Siberian ponies, and, as he avers, the most complete outfit ever carried by an Arctic expedition. It will not be necessary, he thinks, to have his base at the northernmost extremity of Franz Josef Land

before the 22d of March, 1902, a month after the return of the sun, in order to reach the Pole, a distance of 550 miles, in season.

He proposes to return by the Polar current along the east coast of Greenland, and, that there may be no confusion of mind with regard to his undertaking, he makes this declaration *urbi et orbi* :

I desire here to emphasize the fact that the Baldwin-Ziegler Expedition was organized to *reach the Pole.* Neither scientific research, nor even a record of "Farthest North," will suffice; only the attainment of that much-sought-for spot, where one can point only to the south, can satisfy our purpose.

THE BRITISH SHIP *Discovery*, built for the National Antarctic Expedition, left Cowes on the 6th of August, after an inspection by the king.

The *Discovery* was built at Dundee. She has a three years' supply of food and fuel. She is rigged as a bark, displaces 1,750 tons, and measures 172 feet in length on the water-line, 16 feet in depth, and 33 feet in width amidships. Her walls of solid oak are between eight and nine feet thick forward, while they are at least three and one-half feet thick further aft. The bow is covered with steel plates, while the sheer has been designed to encounter pack ice. Bulkheads or partitions, extending crosswise in the ship, have been made to resist side pressure.

The ship has an asbestos lining an inch and a half thick, and when she winters in the ice a cloth of heavy felt will be stretched over her entire length. A powerful steam winch and an extra strong tackle on the mainyard will be employed in dredging operations. There are several cabins for special uses, and a laboratory on deck for the biologist. A room on deck, in which the magnetic instruments will be kept and read, has been shielded from the influence of steel and iron for a distance of thirty feet by the employment of brass where metal is required in that part of the vessel.

The *Discovery* is commanded by Commander R. F. Scott, R.N. The second in command and navigator is Lieut. Albert B. Armitage, R.N.R.

It is left to Commander Scott to decide whether the ship shall winter in the ice. He is to report progress at Melbourne early in 1903.

THE GERMAN ANTARCTIC EXPEDITION, in the steamer *Gauss*, left Kiel on the 11th of August. The *Gauss* is a wooden ship, specially designed for service in the ice, and strengthened by internal timbers and triple planking of oak, greenheart, and pitch pine. Her length

is 151 feet, and she draws sixteen feet of water. She is a three-masted schooner, with engines capable of a speed of seven knots.

The expedition is under the leadership of Professor Erich von Drygalski, of Berlin, famous for his study of Arctic glaciers, and the ship is commanded by Captain Hans Ruser, of Hamburg.

Kerguelen Island, in the South Indian Ocean, is the point to which the *Gauss* will go at first. She is to leave Kerguelen in December. If a passage can be effected through the ice, Dr. von Drygalski will try to make a landing on the Antarctic Continent west of Victoria Land. A winter station once established, sledge parties will be dispatched toward the Pole, and also toward the Magnetic Pole, the position of which is supposed to be in Victoria Land. At the end of the winter the Expedition will proceed to the Weddell Sea, and return home via South Georgia and Tristan Da Cunha.

THE SWEDISH EXPEDITION, under Prof. Otto Nordenskjöld, left Gothenburg, in the *Antarctic*, on the 16th of October.

By an agreement with the British and the Germans, the Swedes are to explore the region of the Antarctic south of the Atlantic Ocean. Prof. Nordenskjöld gives the following sketch of his proposed work: We shall proceed to Buenos Ayres and Tierra del Fuego, and thence to the Antarctic regions. We shall push as far south as possible, and when winter comes we shall send on shore a party of six persons, of whom I shall be one. We shall build a small hut, and engage in meteorological, magnetic, hydrographic, and other scientific observations. As soon as we have landed, the *Antarctic* will return to Tierra del Fuego, and a scientist, who will sail with her, will conduct the researches in that hitherto little-explored country. In this way we shall make as much of our time as possible.

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M. FROIDEVAUX'S PARIS LETTER.

PARIS, Sept. 20, 1901.

The *Service Géographique de l'Armée* received in 1887 not only its present name but its organization, of which I propose to say a few words in beginning this letter. Charged, as it is, with all the geodetic, topographic, and cartographic work necessary to the army in time of peace as in war, as well as with the perfecting of the instruments in use, the *Service Géographique* constitutes a department of the Ministry of War, and is divided into five sections, each with its proper functions and its special field. Each one of these sections (Geodesy, Surveys, Topography, Cartography, Accounts) has its responsible head to superintend the execution of the work prescribed by the *Directeur du Service Géographique*, who is at present Gen. Bassot, *sous-chef* of the General Staff of the Army, and member of the Academy of Sciences.

The personnel of the Geodetic section (which is under the *chef d'escadron d'artillerie* Bourgeois) determines the primary chains of triangles for laying down maps, measures arcs of meridian and parallels, and fixes in azimuth, latitude, and longitude the principal points of its triangulations. The measurement of bases, triangulations with their resulting calculations and the observations attached to researches on the forms of the land belong also to this section.

The section of Surveys under M. Romieux, lieutenant-colonel of engineers, performs the topographical work on a large scale, requiring mathematical exactitude.

M. Romieux is also at the head of the section of Topography, which makes surveys on the ground and the new maps, besides keeping up, by means of annual revisions, the map of the General Staff, preparing and executing surveys in Algeria, and establishing maps of foreign countries and the French colonies.

Col. Berthaut, of the infantry, is the head of the section of Cartography, the technical section of the *Service Géographique*. This section reproduces the work of the first three, brings together and groups the results, gives them a definitive form, and publishes them in maps on different scales. A number of officers are busied with French cartography, others with that of foreign countries; and the Section comprises working rooms for drawing, for engraving on

zinc and copper, for photography, heliogravure, electrotyping, and printing.

The section of Accounts regulates the employment of the funds of the *Service Géographique* and attends to the storing and distribution of the maps and to their sale for the Treasury.

In my next letter I shall present a summary of the work done by the *Service Géographique*, as now organized.

The vacation this year has been marked, as always, by the meeting of congresses, of which mention must here be made. The first was the National Congress of French Geographical Societies, held at Nancy in the beginning of August; the twenty-second session of this now well-established institution.

At this Congress, presided over by Vice-Admiral Fournier, several communications of an interesting character were made. M. Fauvel advocated the unification of the conventional signs employed in maps, and uniformity of scale (at least in countries which recognize the metric system), and the respect of the old denominations of localities drawn from an earlier form of the language or from dialect. The Congress expressed its wish that geographers and topographers might agree to adopt a single series of conventional signs, and that all maps should hereafter be constructed on simple scales, the denominators of which should be the factors 1, 2, and 5, and their multiples and sub-multiples. M. B. Auerbach presented a programme of decentralisation, calling for a geographical study of the natural regions of France, to serve as a basis for territorial divisions better adapted to the political and social life. This very delicate question will be brought before the next Congress, which is to meet at Oran in April, 1902.

The meeting of the French Association for the Advancement of Science was held in September at Ajaccio, Corsica, under the presidency of Dr. Hamy. The geographical section, of which Prince Roland Bonaparte is the head, has done a great deal of work; but the most important communications relating to Corsica were presented in other sections.

M. Th. Moureaux studied the distribution of the magnetic elements in the island on the 1st of January, 1896; M. V. Raulin offered his conclusions drawn from the recorded observations of the rainfall in Corsica for the period 1855–1899; M. A. Brive dwelt on the parallelism of the tertiary formations of Corsica and Algeria; and M. Roule, in a paper on the fishes of the Corsican coast, compared this portion of the island fauna with that of other localities in the western basin of the Mediterranean. Other inter-

esting papers may be noted: that of M. Meunier, on the cause of the disappearance of the ancient glaciers; that of M. Emile Belloc, on the reservoir lakes of the Pyrenees; the study of the ancient *massif* of the Barbary coast, with its influence on the structure of the coast ranges of Algeria, by M. Ficheur; the Abbé Radot's observations on the part played by the winds on the plateau of Langres; and the Fauna of the Arabian coasts, by M. Ch. Perez.

A word must be said of the singularly interesting display at Brussels of the paintings, sketches, and water-colours brought from Katanga by the painter Léon Dardenne, who accompanied Capt. Lemaire in his travels in 1898–1900. No such collection, rendering with truthfulness and vigour the aspect of the country and the details of the native life, had been back brought by any previous traveller.

It was in August that a number of geologists, collaborators of M. Michel Lévy, devoted their holiday time to a study of the Mont Dore, one of the most interesting regions of Auvergne, visited in August by the Geologists' Association, under the guidance of Messrs. Glangeaud, Giraud, and Boule.

At another point an accident furnished an opportunity for the decision of a question of local geography. It had frequently been suggested that the source of the Loue (in Franche-Comté), which is remarkably full and powerful, was a subterranean infiltration from the Doubs; but there was no proof of the fact until a fire occurred in an absinthe distillery at Pontarlier and thousands of gallons of the fluid were emptied into the Doubs, colouring the waters with a characteristic milky tint, which made its appearance a few days later in the stream of the Loue.

Many hydrological problems of a similar nature are still waiting solution. One of the most interesting is that of the Trou di Toro, studied without success by M. Emile Belloc, in the region of the headwaters of the Garonne. With regard to that of the Touvre (Charente), M. E.-A. Martel has confirmed by later investigations the explanation given in 1892, and has shown why the volume of this river increases and diminishes without ever running dry.*

In an article in *La Géographie*, for July, M. Martel presents a summary of his season's work in 1900. He finds that for mountain water-courses, as well as for the streams of the plain, the law holds

* The Touvre is supplied by three streams which flow from vast subterranean reservoirs.

good that for the increase of rapidity the volume of water is a factor much more important than the slope.

Worthy of attention, in an earlier number of the same review, is the paper in which M. Ph. Glangeaud, of the University of Clermont-Ferrand, studies, with the help of M. V. Sabatini's work, the history of the volcanoes of Latium (the Alban Mountains), the most important of the extinct volcanic centres in Central Italy, and traces the analogy of some parts of their history with that of the volcanoes of Iceland and of Auvergne.

The French explorers in Africa are extremely active. In Morocco, M. de Ségouzac has made with success a most dangerous expedition to the Rif; and M. Edmond Doutté, in a journey from Casablanca to Marakesh and Rabat, has studied the social and religious life of the people and investigated the relics of the Portuguese domination. At the other extremity of Barbary, M. Méhier de Mathuisieulx travelled, in April and May of this year, in Tripoli—a country hardly more than seen by the illustrious Barth in 1845 and closed against Europeans since that time by the Turks.

Col. Peroz has added to our knowledge of the region between Sorbo-Haussa and Zinder, and much has been done for the geology of the Gabun and the Cristal Mountains by M. Brousseau; while farther north, in the districts of the Campo and the Benito rivers, a reconnoissance by M. Lesieur gives an entirely new aspect to the map of the northern French Congo.

In the southeast, in the bend of the Ogowe and the Ngunie basin, a number of topographical surveys made in 1899–1900, by Lieuts. Rouyer, Gritty, and Avelot, have revealed the existence of the Bumi, an important affluent of the Manjibe, the mouth of which was located by the regretted Dutreuil de Rhins. In the interior, Messrs. Fredon and Cadenat have explored the Bali river, which proves to be the upper Lobaï. An interesting note on this reconnoissance was contributed by M. Fondère to *La Géographie* for August, which contains, also, a very exact report by Capt. Julien, on his journey from Mobaye to Krébedjé in 1899 across the Banghi basin and the Bugbu and Aduma countries. In this way every day adds to the knowledge of the French Congo; and much may be expected in Madagascar from the researches of M. Guillaume Grandidier.

Asia, as well as Africa, has her advocates and her distinguished explorers, and in the front rank of these we must place Prince Henry of Orleans. His crossing of the continent from northwest to southeast with M. Bonvalot, and his itinerary, in company with

Lieut. Roux, from Tonkin to the frontiers of British India, together with his published accounts of these and other journeys, revealed in him one of our best travellers, as well as a sagacious observer, who studied in detail the progress of the French Asiatic colonies, in the future of which he entertained a robust faith. He had just started on a new journey in the Far East when he was struck down by two dangerous complaints. The last of his Indo-Chinese studies is the story of his travels from Kratié to Nha-Trang, across Dar-Lac, a little-known and rarely-visited country, printed in the September number of *La Géographie*, with a sketch map. This paper and Comte Pierre de Barthélemy's reconnoissance of the Moïs Stiengs country complete in many ways the information gathered by the Pavie Mission.

In America a serious economical study of the north of Costa Rica was made in July, 1898–June, 1899, by M. Jules Second, and has been brought to our knowledge by Baron Hulot, who has set forth the results obtained in the districts drained by the San Carlos and the Rio Frio.

The French geodetic mission to Ecuador for the measurement of the arc of the meridian has selected the city of Riobamba for the starting-point of its work, which is directed by Commandant Bourgeois of the geodetic service of the army. Another French mission undertakes a general triangulation of part of the Bolivian plateau, from La Paz and Lake Titicaca to Oruro, to make astronomical observations and a detailed cartographic survey on a scale of 1:50,000. These operations will be conducted by Messrs. Bastide (father and son), Grimaldi, and Vaudry; while M. Dereims will study the geology of the country. In this way there will be made the beginning of a national map of Bolivia—something which neither Chili nor the Argentine Republic can be said to possess.

The detailed reports of some of the congresses held in Paris in 1900, now published, contain precious material for geographers. Foremost among these reports is that of the XXIst Session of the National Congress of the French Geographical Societies, brought out by the *Société de Géographie*. Some of the papers presented—that of M. Flamand, for instance, on the Reliefs and the Depressions of the Sahara—have not been printed; but the volume offers such studies as M. Marcel Dubois' article on the Definition and the Limits of Geography and the Classification of Geographical Sciences, the papers of Gen. Bassot, Commandant Bourgeois, and Col. Berthaut on the Present and Future Work of the *Service Géographique de l'Armée*, M. A.-A. Fauvel's essay in critical bibliography, entitled

New Chinese Cartography, and the note of M. V. Demontès on the Comparative Density of the European and the Native Populations in Algeria. Not less important is the second volume (Notes et Documents) of the 29th Session of the French Association for the Advancement of Science. In this, M. Jean Brunhes treats of the Boulevard as a feature of Town Geography; Messrs. J. Demorlaine and J. Poisson write on the Fixation of Dunes; M. Raulin considers the Observations on Precipitation in the Equatorial Zone (10° N. Lat. to 10° S. Lat.); and there are most instructive notes, such as that of M. F.-G. Dollfus on the Structure of the Paris Basin, that of M. E. A. Martel on the Subterranean Explorations accomplished in 1884–1900, and that of M. A. Leclère on his Geological Exploration in the Chinese Provinces bordering on Tonkin.

In the *Bibliothèque des Sciences Contemporaines*, the volume on Geology, by M. H. Guède, contains much that is valuable to geographers. The whole of the first book is devoted to the external and the internal geodynamics—that is to say, to the modes of manifestation of the modern energy. This very clear and precise résumé will be of great service to those who are beginning the study of physical geography, in spite of the fact that already it needs revision in one of its parts.

Information of the first importance, in fact, is furnished on a capital point of physical geography by the work of M. Charles Rabot on the Variations in Length of Glaciers in the Arctic and Northern Regions, and geologists will have to consider his conclusions, as well concerning the historical record of the variations as on the modes and forms of their manifestation.

M. Georges Blondel makes a contribution to economical literature in his solid volume, *La France et le Marché du Monde*. This opens with a picture of the economical development of the new countries; then goes on to show how the neighbours of France maintain their struggle against foreign competition, and closes by an examination of the question why the French people develop in so slight a degree, with an inquiry into their economical revival.

An excellent volume on the *Puy-de-Dôme et Vichy* belongs to the collection of Guides, begun in 1899, under the charge of M. Marcellin Boule. This, like the preceding volumes of the series, is composed of two parts (1 : Monograph of the Department; 2 : Itineraries), and is equally useful and helpful to the tourist, the man of science, and the archæologist. Dr. Delisle, of the Museum of Natural History, has brought out a study of the Montagne Noire et le Col de Naurouze. In this Story of an Error in Geography,

as he calls it, Dr. Delisle shows that the Cevennes do not come to an end, as the geographies declare, with the Montagne Noire at the Col de Naurouze, but that the Montagne Noire forms a *massif*, very clearly bounded on the south by the Fresquel, and on the west by the broad depression of the plain of Revel; beyond this rises a new relief in the hills of Lauraguais, or St. Félix, which separate the plain of Revel from the Pass of Naurouze.

One of the most noteworthy books published on West Africa, since the now classic volume of Capt. Binger, is Capt. d'Ollone's *De la Côte d'Ivoire au Soudan et à la Guinée*, an account of the march of the Hostains-d'Ollone party across the cannibal-haunted dense forest which stretches for a breadth of 350 miles from the Atlantic shore of the Ivory Coast and Liberia to the French Sudan.

The work is in two parts; one relates the events of the journey, the other contains the scientific appendices.

The Congo Free State has recently distributed a remarkable map (on a scale of 1:100,000) of the country between the Atlantic and Stanley Pool, with excellent notices by M. Hubert Droogmans. This fine publication—in fifteen sheets—is the first topographical map of this part of Africa.

In the new volume (continuing the series of works of the Pavie Mission, begun several years since by the Ministry of Public Instruction), M. Pavie tells how he was led, during his sojourn at Kampot, in Cambodia, to interest himself in the natives of eastern Indo-China, and to extend his acquaintance with the unexplored districts of their country. He began by travelling alone (from 1880 to 1885) in Cambodia and Siam, and then continued his explorations to the year 1889, in company with Capt. (now Commandant) Cupet and Capt. Nicolon, through Siam, Laos, Tonkin, and Annam. The present volume, illustrated by engravings and numerous maps, will be followed by a second, containing the work of the Mission for the period 1890–1895, and several volumes of narratives and accounts of travel, one of which (by Capt. Cupet) has already appeared. Though so little progress has been made with this publication (out of 10 volumes only 4 are as yet in print), it may be affirmed that those who find occasion to seek information on the subject of French Indo-China must always have recourse to its pages. By the side of such a work the narratives of Mme. Isabelle Massieu and Count Barthélemy are no more than notes jotted down by tourists, and devoid of scientific observation; while in the works brought out by M. Pavie and Capt. d'Ollone scientific information, instruction, and entertainment go hand in hand.

HENRI FROIDEVAUX.

OBITUARIES.

Charles A. Peabody.

Mr. Peabody, a Fellow of this Society since 1871, and for the past seven years a Member of the Council, died in New York on the 4th of July last at the age of eighty-seven years.

He was born at Sandwich, New Hampshire, and was graduated from the Harvard Law School in 1837. In 1855 he was appointed Justice of the Supreme Court of New York State; and in 1862 President Lincoln made him Judge of the United States Provincial Court for Louisiana. He was Judge also of the Criminal Court in New Orleans, and he became in 1863 Chief Justice of the Supreme Court of Louisiana. In 1865 he was appointed U. S. Attorney for the Eastern District of Louisiana, but resigned the position, and returned to New York, where he resumed the practice of the law till within a few years of his death.

Baron A. E. Nordenskjöld.

This great naturalist and Arctic explorer died in Stockholm on the 12th of August at the age of sixty-nine years.

Nordenskjöld was born at Helsingfors, and educated in the university of his native place. He settled in Sweden, where in 1858 he became Professor of Mineralogy in Stockholm. He made numerous voyages in the Polar seas, and undertook in 1870 to explore the inland ice of Greenland. This journey gave him an opportunity to study the nature of the ice formation, previously unseen by any geologist. He and his companion Dr. Berggren made rich collections of plants, marine animals, and stone implements. As the result of his inquiries and observations during this expedition he recorded the judgment [not confirmed by the experience of others] that dogs could not be employed with advantage in long sledge journeys in the regions where no game was to be had. In 1872 he made a voyage to Spitsbergen; and another in 1875 to the Kara Sea and the Yenisei River. The memorable passage of the *Vega* around the Arctic coast of Europe and Asia followed, in 1878–1879. In 1883, Nordenskjöld penetrated the ice on the east coast of Greenland—the last of his explorations.

Besides his many scientific papers he wrote: The Voyage of the *Vega* round Europe and Asia; The Second Swedish Expedition to Greenland; and two contributions of remarkable value to the history of cartography—The Facsimile Atlas, and The Periplus.

Baron Nordenskjöld was elected a Corresponding Member of the American Geographical Society in 1872, and an Honorary Member in 1878.

John Fiske.

Prof. Fiske died on the 4th of July last, at East Gloucester, Massachusetts.

He was born at Hartford, Connecticut, in 1842, and his name was originally Edmund Fiske Green. At the age of 13 he took the name of his great-grandfather, John Fiske of Middletown, in which place his boyhood was passed. He was graduated at Harvard University in 1863, and at the Law School in 1865; but he never practiced law. He became University Lecturer on philosophy and history, and he was for more than twenty years a member of the Board of Overseers.

Mr. Fiske was remarkable from his earliest years for devotion to study. He acquired languages with facility, and ranged through literature and science with equal zest and thoroughness. He was a good musician and singer, and he found time, with all his omnivorous reading, for out-of-door life and recreation. Though overweighted with flesh, he was apparently in robust health in spite of an absolute indifference to the laws of hygiene. His manner of life was described hy himself in these words:

> Always sit in a draft, when I find one; wear the thinnest clothes I can find, winter and summer; catch cold once in three or four years, but not severely, and prefer to work in a cold room, 55 to 60 degrees. Work the larger part of each twenty-four hours, and by day or night indifferently. Scarcely ever change a word when once written, eat when hungry, rarely taste coffee or wine or smoke a cigar, but drink two or three quarts of beer each day, and smoke a pipe all the time when at work. Never experienced the feeling of disinclination for work, and, therefore, never had to force work. If I feel dull when at work, a half hour at the piano restores normal mental condition, which is one more argument for the hygienic and recuperative effects of music.

He was a prolific writer on almost all subjects, his more extended works being philosophical and historical; and all his productions were marked by sound scholarship, masculine good sense, and fairness of mind, which found expression in a clear and animated style, marred by occasional lapses into colloquialism. His contributions to American history may be regarded as his enduring monument.

Mr. Fiske was elected a Corresponding Member of the American Geographical Society in 1896.

NOTES AND NEWS.

PROF. CARLOS F. DE MELLO, of S. Paulo, is about to publish in Berlin, in French, a work on The Laws of Geography. This work consists of two parts. In the first the author considers the problem of the laws of science, and applies it to the present state of geography; in the second he studies the laws of mutual dependence.

The facts and the proofs, from the point of view of statical geophysics, are made to speak for themselves, either by the geographical and historical demonstration of their truth or their erroneousness, or by the revival of principles seemingly forgotten.

A bibliography of 500 entries, arranged chronologically, will enable the reader to turn to the sources.

IT IS ANNOUNCED in the National Geographic Magazine for October that the next International Geographical Congress (the Eighth) will be held in Washington in 1904, under the auspices of the National Geographic Society.

PROF. GEORGE DAVIDSON, of the University of California, sends the following interesting communication, made by him to the Geographical Society of the Pacific:

DAVIDSON OBSERVATORY
SAN FRANCISCO, CALIFORNIA,
August 26/01.

The Geographical Society of the Pacific, San Francisco:

GENTLEMEN :

During the last four years I have had numerous inquiries concerning the origin of the name *Cape Nome*, on the Northwest Coast of Norton Sound, Alaska. I searched every available chart and narrative of that region to trace it home.

I traced it back to Admiralty chart No. 2172, of 1853, as being the earliest to use the name; it is not in the Great Atlas of Tebenkof of 1848–'52, devoted to the North Pacific.

I looked up the tracks of the Sir John Franklin rescue ships H. M. frigate "Herald" and brig "Plover" (1845–'51), and became satisfied the name was given in the cruises of one or other of those vessels.

A short time since I wrote to the Chief Hydrographer of the Admiralty and asked if the name *Nome* appeared among the lists of officers of the "Herald" and "Plover."

To-day I have a letter from the Hydrographer of the Admiralty, dated London, August 9th, which contains this statement :

"When the MS. chart of this region was being constructed on board H. M. S. 'Herald,' attention was drawn to the fact that this point had no name, and a mark —(? Name)—was placed against it.

"In the hurry of dispatching this chart from the ship this ? appears to have been inked in by a rough draughtsman, and appeared as Cape Name; but the stroke of the 'a' being very indistinct it was interpreted by our draughtsman here as C. Nome, and has appeared with this name ever since.

"This information is from an officer who was on board the 'Herald' when the chart was being constructed."

So the mystery of the name has been satisfactorily solved.

Very respectfully,

GEORGE DAVIDSON.

THE STATISTICS of the French colonies (Importation and Exportation) for 1898 present the following figures, as printed in the volume just issued by the Ministère des Colonies:

IMPORTATION: 289,132,768fr. 70c. This shows an increase of 32,326,290fr. 66c. over the return for 1879 and an increase of 53,117,541fr. 87c. above the mean for the five years.

EXPORTATION: 287,016,707fr. 86c.; an augmentation of 23,306,050fr. 03c. above the figures for 1897 and an increase of 38,077,645fr. 90c. above the mean for the five years.

The returns for Algeria and Tunisia are not included in the Statistics of the Colonies.

For Algeria the importations amounted in 1898 to 302,223,058fr. and the exportations to 285,768,687fr.

For Tunisia the importations in 1898 were 53,521,152fr. and the exportations 44,196,837fr.

SR. JULIO CÉSAR VALDES, First Secretary of the Bolivian Legation at Santiago de Chile, sends a copy of a work entitled *Bolivia y Chile*, in which he examines the historical antecedents and the present state of the question at issue between the two countries. The American Geographical Society can have no opinion to express on such a matter, but it is a duty to say that Señor Valdes reasons well and closely and presents the case of Bolivia with calmness and dignity. He says in his preface:

This is not a polemical work. It is a plain and brief statement, supported by documents, of the right of Bolivia to exercise dominion and sovereignty over the desert and shore of Atacama, and of the development of the question with Chile since the war of 1879.

The book was published at Santiago at the close of the year 1900.

IT IS A PLEASING DUTY to congratulate the Société Nationale des Sciences Naturelles et Mathématiques de Cherbourg on the approaching completion of its first half-century. The Society was founded on the 30th of December, 1851, and more than thirty octavo volumes of its publications testify to the learning and activity of its members.

The Royal Geographical Society of Antwerp will celebrate the Twenty-fifth anniversary of its foundation by holding a Cartographical, Ethnographical, and Maritime Exhibition, to be opened in May, 1902.

Sr. João de Moraes Pereira writes from Horta, Fayal, under date of August 12, that, with the help of Prof. McLeod, of McGill University Observatory, and Mr. Hughes, of the American Commercial Cable, he has determined telegraphically the position of Horta Castle in Latitude 38° 31′ 45″, north, and Longitude 1 h. 54 m. 30.61 sec., west of Greenwich. This is thought to be the first Portuguese position fixed by time sent across the Atlantic.

The International Association of the Merchant Marine held its first Congress at Monaco on the 12th of April last in the Oceanographical Museum, erected for the preservation of the collections made by the Prince of Monaco in the Bay of Biscay, the Cape Verde Islands, Newfoundland, and Spitsbergen, and destined, it is hoped, to become the central oceanographic institute of the world.

Fifteen nations were represented at the meeting.

Mme. Cordozo de Béthencourt presented the first communication, on the subject of Homes for Seamen, and the Congress favoured the establishment of these houses in all seaports. This does not seem to be a new suggestion.

Lieut. Tapissier made a report on the use of kites and other aerial helps for life-saving; and M. Charles Bénard, President of the Oceanographical Society of the Bay of Biscay, discussing the question of life-saving apparatus on shipboard, advocated the principle of insubmergible rafts, utilised in ordinary as gang-planks. The sinking of the ship would leave these floating, and before putting to sea each mariner and passenger should have his place on the raft pointed out to him. M. Bénard spoke also of the nourishment of shipwrecked parties by means of systematic fishing, as studied and recommended by the Prince of Monaco.

The Congress hoped to see the adoption of the insubmergible rafts on the ocean steamers, and the posting of regulations for the embarkation of passengers and crew, in case of disaster, as well as the furnishing of the rafts with the apparatus for fishing.

Chevalier Pesce, Secretary of the Congress, proposed the creation of a permanent International Maritime Bureau for the regulation of ocean travel. The seat of this central Bureau would

naturally be Monaco, and the Prince, already burdened with cares none the less accepted the task of moving the great maritime Powers to action in the matter.

Courteous acknowledgment is made of an invitation to attend a festival on the 26th and 27th of October, to celebrate the Hundredth Anniversary of the foundation of the Naturhistorische Gesellschaft in Nürnberg.

The Geographical Society of Tōkyō communicates the sad intelligence of the death, on the 24th of May last, of Mr. Watanabe Hiromoto, Vice-President of the Society, and its principal founder.

BULLETIN

OF THE

AMERICAN GEOGRAPHICAL SOCIETY.

Vol. XXXIII | 1901. | No. 5

SPIRITUAL BEINGS IN WEST AFRICA—THEIR NUMBER, LOCALITY, AND CHARACTERISTICS.

BY

ROBERT HAMILL NASSAU.

The belief in spiritual beings opens an immense vista of the purely superstitious side of the theology of Bantu African religion. All the air and the future is peopled with a large and indefinite company of these beings. The attitude of Creator—Anyambe—toward the human race and the lower animals being that of indifference or of positive severity in having allowed evils to exist and His indifference making Him almost inexorable, effort in the line of worship is, therefore, directed only to these spirits who, though they are all probably malevolent, are to be influenced and may be made benevolent.

I. Origin.—The native thought in regard to the origin of the spirits is vague. Necessarily so. An unwritten belief that is not based upon revelation from a superior source, nor on an induction of actual experience and observation, but that is added to and varied by every individual's fancy, can be expressed in definite words only after inquiry among many as to their ideas on the subject. These, I find, coincide on a few lines; just as the consensus of opinion on any subject in any community will find itself running in certain channels, influenced by the utterances of the stronger or wiser leaders.

(1) It appears, therefore, that some of the spirits seem to have been conterminous with the life of Paia-Njambi in the Eternities. An eternity past, impossible as it is for any one to comprehend, is yet a thing thinkable even with the Bantu African, for he has words to express it: "peke-najome" (ever-and-beyond), "tamba-na-

ngama" (unknown-and-secret). Away back, in that unknown time, existed Paia-Njambi. Whence, or how, is not inquired by the natives; nor have I had any attempt even of a reply to my own inquiries. He simply existed. They are not sufficiently absurd to say that He created Himself. To do that he would need to antedate Himself. I have met none who thought sufficiently on the subject to worry their minds, as we, in our civilization, often do in effort to go back and back to the unthinkable point in time past, when God was not. Indeed so little is the native mind in the habit of any such research that I can readily perceive how their "We don't know" could easily be misunderstood by a foreign traveller, scientist or even missionary as a confession that "they did not know God." A statement which is true, but it is not the equivalent of or synonymous with that traveller's assertion that the native had no idea of a God. The native thought, wiser than ours, simply and unreasoningly says, "He is, He was." Conterminously with Him in origin there may have been some other spirits. This has been said to me by a very few persons with some hesitation. But if those spirits were indeed equal in existence with Njambi, they were in no respect equal to Him in character or power, and had no hand in the creating of other beings. In the Mpongwe tribe at Gaboon one winter Rev. J. L. Wilson, D.D., fifty years ago, thought the belief existed that, "Next to God in the government of the world are two Spirits, one of whom, Onyambe, is hateful and wicked. The people seldom speak of Onyambe, and always evince displeasure when the name is mentioned in their presence. His influence over the affairs of men, in their estimation, does not amount to much; and the probability is that they have no very definite notions about the real character of this Spirit." His character would be indicated by his name (O-nya-mbe (He) Who-is-bad). This name has sometimes been used by missionaries to translate our word "Devil." (Perhaps the idea of the word itself came from long-ago contact of this coast-tribe with foreigners.)

(2) A second and more recognized source of supply to the company of spirits is original creation by Njambi. While this origin is named by some I have not found it believed in to any very great extent. Even those whom I did not find believing it had very vague ideas as to the mode or object of their creation. Of the creation of mankind, and even of the Fall, almost all of the tribes have legends, more or less distinct, and with a modicum of truth, doubtless derived from traditions coinciding with the Mosaic history.

But of a previous creation of purely spiritual beings I have found no legend nor well-defined story. If such specially created spirits exist at all their relation to Njambi is of a very shadowy kind. They are, indeed, inferior to Njambi, and are in theory under his government in the same sense that human beings are. But Njambi, in his far-off indifference in actual practice, does not interfere with or control them or their actions. They are part of the motley inhabitants of "Njambi's Town," the place of the Great Unknown, as also are all the other living beasts and beings of creation. They also have their separate habitat, and pursue their own devices, generally malevolent, with the children of men.

(3) But the general consensus of opinion is that the world of spirits is peopled by the souls of dead human beings. This presupposes a belief in a future life, the existence of which in the native mind some travellers have doubted. I have never met that doubt from the native himself. While I do not impute to the travellers referred to any desire, in their efforts at describing the low grade of intelligence or religious belief of certain tribes, to misrepresent, I fully believe they were mistaken; their mistake arising from misunderstanding. It is not probable that they met, in the course of their few years, what I have not met with in a lifetime. It is probable that natives had expressed to them a doubt, or even ignorance, of a general resurrection, and may have said to them, as a few have said to me, "No, we do not live again. We are like goats and dogs and chickens. When we die that is the end of us." Such a statement is indeed a denial of the resurrection of the body; but it is not a denial of a continued existence of the soul in another life. The very people who made the above declaration to me preserved their family fetish, made sacrifices to the spirits of their ancestors, and appealed to them for aid in their family undertakings. The few who have expressed a belief in transmigration did not consider that the residence of a human spirit in the body of a beast was a permanent state; it was a temporary condition assumed by the spirit voluntarily for its own pleasure or convenience and terminable at its own will, precisely as human spirits, during their mortal life, are everywhere and by all believed capable of temporarily deserting their own human body and controlling the actions of a beast. This belief in transmigration, though not general, has been found among individuals in almost all tribes.

It being thus generally accepted that all departed human souls become spirits of that future that is all around us, there is still a

difference in the testimony of intelligent witnesses as to who and what or even how many of these souls are in one human being. Ordinarily, the native will say in effect, "I am one, and my soul is also myself. When I die it goes out somewhere else." Others will say, "I have two things—one is the thing that becomes a spirit when I die, the other is the spirit of the body and dies with it." [This "other" may be only a personification of what we specify as the animal life.] But it has frequently occurred that even intelligent natives, standing by me at the side of a dying person, have said to me, "He is dead." The patient was indeed unconscious, lying stiff, not seeing, speaking, eating, or apparently feeling; yet there was a slight heart-beat. I would point out to the relatives these evidences of life. But they said, "No, he is dead. His spirit is gone, he does not see nor hear nor feel. That slight movement is only the spirit of the body shaking itself. It is not a person. It is not our relative. He is dead." And they began to prepare the body for burial. A man actually came to me once asking me for medicine with which to kill or quiet the body-spirit of his mother, whose motions were troubling him by preventing the funeral arrangements. I was shocked at what I thought his attempt at matricide; but subsequently found that he really did believe that his mother was dead and her real soul was gone.

Such attempt to distinguish between soul-life and body-life has not infrequently led to premature burial. The supposed corpse has sometimes risen to consciousness on the way to the grave. A long-protracted sickness of some not very valuable member of the village has wearied the attendants; they decide that the body, though mumbling inarticulate words and aimlessly fingering with its arms, is no longer occupied by its personal-soul; that has emerged. "He is dead." And they proceed to bury him alive. Yet they deny that they have done so. They insist that he was not alive; only his body was "moving." Proof of premature burial has been found by discoveries connected with a certain custom performed when a village has been afflicted with various troubles after the death of one of its members. The village, after ineffectual efforts to drive away the evil influences that are supposed to cause these troubles, decide that the Spirit of some dead relative is dissatisfied about something, and order the grave to be opened and the bones rearranged, or even thrown into the river or sea. On opening the grave, corpses that have been buried in a recumbent position have been found in a sitting position. It is possible for one thus prematurely buried to change posture in a

dying struggle ; for mostly heathen graves are shallow (even among those who so dig graves at all), and are hastily and not always filled in.

Another set of witnesses will say that, besides the personal-soul and the soul of the body, there is a third entity in the human unit—namely, a dream-soul. That it is which leaves the body on occasions during sleep, and, wandering off, delights itself by visiting strange lands and strange scenes. On its return to the body, its union with the material blunts its perceptions, and the persou in his efforts to remember or tell what he has seen relates only the vagaries of a dream. [A psychological view which, under the manipulation of a ready pen, could give play to fantasies, pretty, romantic and not unreasonable and not impossible.]

Some who are only dualists nevertheless believe in the wanderings of this so-called dream-soul, but say that it is the personal-soul itself that has gone out and has returned. Both dualists and trinitarians add that sometimes in its wanderings this could lose its way and cannot find its body, its material home. Should it never return, the person will sicken and die.

A fourth entity is vaguely spoken of by some as a component part of the human personality; by others as separate but closely associated from birth to death, and called the Life-Spirit. Some speak of it as a civilized person speaks of a guardian angel. Regarded in that light, it should not be considered as one of the several kinds of souls, but as one of the various classes of spirits (which will be discussed in a subsequent chapter). To it, worship is rendered by its possessor as to other spirits ; a worship, however, different from that which is performed for what are known and used as "Familiar Spirits." Others speak of the vague Life-Spirit as the "Heart." The organ of our anatomy which we designate by that name they call by a word which variously means "heart" or "feelings"; much like our old English "Bowels," the same word being employed equally to designate a physical organ and a mental state. Considering the organic heart as the seat (or a seat) of life, the natives believe that by witchcraft a person in health can be deprived of his Life-Soul or "Heart"; that he will then sicken ; that the wizard or witch feasts in his or her magic orgie on this "Heart"; and that the person will die if that heart is not returned to him.

II. Number.—But what even this human soul may be, whether existing in unity, duality, trinity, or quadruplicity, all agree in

believing that it adds itself, on the death of the body, as another in the multitudinous company of the spirit-world. That world is all around us, and does not differ much in its wants and characteristics from this earthly life, except that it is free from some of the limitations to which material bodies are subject. In that spirit-world they eat the same food as when on earth, but only its essence, the visible substance, remains. They are possessed of all their passions, both bad and good. Men expect to have their wives with them in that future. [But I have never heard the idea even named, that there is procreation by spirits in that after-world.] Not having believed during this life in a system of reward and punishment, they have no belief in heaven or hell. All the dead go to Njambi's Town ; and live in that new life together, good and bad, as they lived together on earth. [The "Hell" spoken of by some of my informants, I believe, is not a native thought. It was probably engrafted on the coast tribes by the Portuguese Roman Catholic missionaries of three hundred years ago.]

If, therefore, the spirits consist entirely of the souls of departed human beings, how immense their number! Innumerable as are all the dead that have passed from this life in the ages gone by, excepting those who have gone permanently into the bodies of new human beings. That form of metempsychosis is believed in. Occasional instances of belief of transmigration into the body of a lower animal do not necessarily include the idea of a permanent residence there ; or that the departed soul has lost its personality of a human being and has become that of a beast.

But the idea of reappearance in the body of a newly-born child was formerly believed in, especially in regard to white people. Thirty years ago I wrote ("Crowned in Palmland," page 234): "Down the swift current of the Benita, as of other rivers on the coast, are swept floating islands of interlaced rushes, tangled vines and water lilies that, clinging to some projecting log from the marshy bank, had gathered the sand and mud of successive freshets and gave a precarious footing for the pandanus, whose wiry roots bound all in one compact mass. Then some flood had torn that mass away; and the pandanus still waving its long, bayonet-like leaves, convolvuli still climbing and blooming, and birds still nesting trustfully, the floating island glided past native eyes down the stream, out over the bar, and on toward the horizon of broad ocean. What beyond? Native superstition said that at the bottom of the 'Great Sea' was 'White Man's Land'; that thither some of their own departed friends found their happy future, exchanging a dusky

skin for a white one; that there white man's magic skill at will created the beads and cloth and endless wealth that came from that unknown land in ships, in whose masts and rigging and sails were recognized the transformed trees and vines and leaves of those floating islands. When on the 12th of July, 1866, a few with bated breath came to look on my little new-born Paul—the only white child most of the community had seen, and the first born in that region—the old people said, 'Now our hopes are dead. Dying we had hoped to become like you, but verily ye are born as we.'"

Not long after I had arrived at Corisco Island in 1861 I observed among the main people who came to see the new missionary one man who quietly and unobtrusively, but very steadily, was gazing at me. After awhile he mustered courage and addressed me: "Are you not my brother, my brother who died at such-a-time, and went to White Man's Land?" I was at that time new to the superstitions of the country; his meaning had to be explained to me. His thought of relationship was not an impossible one, for many of the Bantu negroes have somewhat Caucasian-like features. I have often seen men and women, at the sight of whom I was surprised, and I would remark to a fellow-missionary: "How much this person reminds me of So-and-So in the United States." This recognition of resemblance of features to white persons living in the United States was the third step in my acquaintance with native faces. At first all negro faces looked alike. Presently I learned differences; and when I had reached the third step I felt that my acquaintance with African features was complete.

III. Locality.—The locality of these spirits is not only vaguely in the surrounding air; they are also localized in prominent natural objects—caves, enormous rocks, hollow trees, dark forests, in this respect reminding one of classic fauns and dryads. While all have the ability to move from place to place, some especially belong to certain localities which are spoken of as having, as the case might be, "good" or "bad" spirits. It is possible for a human soul (as already mentioned in this chapter) to inhabit the body of a beast. A man whose plantation was being devastated by an elephant told me he did not dare to shoot it, because the spirit of his lately deceased father had passed into it. Also a common objuration of an obstreperous child or animal is "O na njemba" (Thou hast a witch).

Their habitats may be either natural or acquired. Natural ones are—for the spirits of the dead, in a very special sense—the villages

where they had dwelt during the lifetime of the body. But the presence of the spirits of the dead is not desired. It is one of the pitiable effects of superstition that its subjects look with fear and dread on what the denizens of civilization look with love and tender regret. We in our Christian civilization cling to the lifeless forms of our dead; and when necessity compels us to bury them from our sight we bid memory call up every lineament of face and tone of voice, and are pleased to think that sometimes they are near us. But it is a frequent native practice that on the occasion of a death, even while a portion of the family are wailing, and to all appearances passionately mourning the loss of their relative, others are firing guns, blowing trumpets, beating drums, shouting and yelling, in order to drive away from the village the recently disembodied spirit. On consideration it can be seen that these two diverse demonstrations are sincere, consistent, and, to the native, reasonable. With natural affection they mourn the absence of a tangible person who as a member of their family was helpful and even kind, while they fear the independent existence of the invisible thing, whose union with the physical body they fail to recognize as having been a factor in that helpfulness and kindness. This departed spirit, joining the company of other departed spirits, will indeed become an object of worship—a worship of principally a deprecatory nature; but its continued presence and immediate contact with its former routine is not desired. In Mashonaland the native "fears that death or accident may overtake him through the instrumentality of some fellow-being who may perchance hold against him a grudge. But a greater dread than this is of a visitation of evil by the spirit of a departed friend or relative whom he may have slighted while living."

A village in Nazareth Bay—the embouchure of one of the mouths of the Ogowe River—is called Abun-awiri (awiri, plural of ombwiri—a certain class of spirits; and abuna—abundance).

Large, prominent trees are inhabited by spirits. Many trees in the equatorial West Africa forest throw out from their trunks—at from ten to sixteen feet from the ground—solid buttresses continuous with the body of the tree itself, only a few inches in thickness, but in width at the base of the tree from four feet to six feet. These buttresses are projected toward several opposite points of the compass, as if to resist the force of sudden wind-storms. They are a very noticeable forest feature. They are very commonly seen in the silk-cotton trees. The recesses between them are actually

used as lairs by small wild animals; supposedly also a favorite home of the spirits.

Caverns and large rocks have their special spirit habitants. At Gaboon, and also on Corisco Island, geological breaks in the horizontal strata of rock were filled by narrow vertical strata of limestone, between which water-action has worn away the softer rock, leaving the limestone walls isolated, with a narrow ravine between them. These ravines were formerly reverenced as the abodes of spirits. When I made a tour in 1882, surveying for a second Ogowe Station, I came some seventy miles up river from my well-established first station, Kangwe, at Lambarene, to an enormous rock, a granite boulder, lying in the bed of the river. The adjacent hillsides on either bank of the river were almost impassable, being covered with boulders of all sizes, and a heavy forest growing in among, and even on, them. This great rock had evidently in the long past become detached by torrential streams that scored the mountain side in the heavy rainy season and had plunged to its present position. The swift river current swirled and dashed against the huge obstruction to navigation, making the ascent of the river at that point particularly difficult. Superstition suggested that the spirits of the rock did not wish boats or canoes to pass their abode. Nevertheless, necessities of trade compelled, and crews in passing made an ejaculatory prayer, but with the fear that the "ascent" in that part of the journey might be for "woe." Whence they called that rock Itala-ja-maguga; which, contracted to "Talaguga," I gave as the name of my new station, erected in 1892, in the vicinity of that rock. During my eight subsequent years at that station I did, indeed, meet with some "woe," but also much weal. And the missionary work of Talaguga, carried on since 1892 by the hands of the Société Evangelique de Paris, has met with signal success.

Capes, promontories, and other prominent points of land are favorite dwelling-places of the spirits. The Ogowe River, some 140 miles from its mouth, receives on its left bank a large affluent, the Ngunye, coming from the south. The low point of land at the junction of the two rivers was sacred. The riverine tribes themselves would pass it in canoes, respectfully removing their head coverings. But passage was forbidden to coast tribes and other foreigners. Portuguese slave traders might come that far; but, stopping there, they could do trade beyond only by hands of the local tribe. [Evidently superstition had been invoked to protect a trade monopoly.] A certain trader, Mr. R. B. N. Walker, agent for the English firm of Hatton & Cookson, headquarters at Libre-

ville, Gaboon, in extending his commercial interests, made an overland journey from the Gaboon River, emerging on the Ogowe, on its right bank, above that sacred point. Ranoke, Chief of the Inenga tribe, a few miles below, seized him, his porters, and his goods, and kept them prisoners for several months. Mr. Walker succeeded in bribing a native to carry a letter to the French Commandant at Libreville, who was pleased to send a gunboat to the rescue. Incidentally, it furnished a good opportunity to demonstrate France's somewhat shadowy claim to the Ogowe. After the rescue a company from the gunboat proceeded to the point and lunched there, thus effectually desecrating it. Mr. Walker made peace with his late captor, and established a trading station at the Inenga village —Lambarene. For years afterward natives still looked upon that point with respect. My own crew, in 1874, sometimes doffed their hats. But before I left the Ogowe, in 1891, a younger generation had grown up that was willing to camp and eat and sleep there with me on my boat journeys.

Graveyards, of course, are homes of spirits; and, of course, are much dreaded. The tribes, especially of the interior, differ as to burial customs. Some bury only their chiefs and other prominent men, casting away corpses of slaves or of the poor into the rivers, or out on the open ground, perhaps, covering them with a bundle of sticks. Even when graves are dug they are often very shallow. Some tribes fearlessly bury their dead actually under the clay floors of their own houses, or a few yards distant in the kitchen-garden adjoining their houses. But by most tribes who do bury at all there are chosen as cemeteries dark, tangled stretches of forest, along river banks, or ground that is apt to be inundated, or whose soil is not good for plantation purposes. I had often observed such stretches of forest along the river, and wondered why the people did not use them for cultivation, being conveniently near to some village, while they would go a much longer distance to make their plantations. The explanation was that these were graveyards. Such stretches would extend sometimes for a mile or two. Often my hungry meal hour on a journey happened to coincide with our passing of just such a piece of forest, and the crew would refuse to stop, keeping themselves and myself hungry till we could arrive at more open forest. Once after yielding to them, and rowing on for another hour, and the same hopelessly tangled graveyard still continued, I, famished, ordered the boat ashore. The crew obeyed unwillingly, and slowly they began to gather firewood with which to cook our luncheon. In pulling sticks from a convenient pile there

was revealed a skeleton. My hunger ceased, and I was willing to row on for another half-hour seeking for a proper camp. In eastern Africa it is believed that "the dead in their turn become spirits under the all-embracing name of Musimo. The Wanyamwezi hold their Musimo in great dread and veneration, as well as the house, hut, or place where their body has died. Every chief has near his hut a Musimo hut, in which the dead are supposed to dwell, and where sacrifices and offerings must be made. Meat and flour are deposited in the Musimo huts, and are not, as with many other people, consumed afterwards. The common people also have their Musimo huts; but they are smaller than that of the chief, and the offerings they make are, of course, not so important as his." (Dècle: "*Three Years in Savage Africa.*")

Beyond the regularly recognized habitats of the spirits that may be called "natural" to them, any other place or location may be acquired by them temporarily, for longer or shorter periods, under the power of the incantations of the native doctor (uganga). By his magic arts any spirit or spirits may be localized in any object whatever, however small or insignificant; and, while thus localized, are under the control of the doctor and subservient to the wishes of the possessor or wearer of the material object in which it or they are thus confined. This constitutes a "Fetish," which will be more fully discussed in another chapter.

IV. The character of these spirits is much the same as the human character they possessed before they were disembodied. They have most of the evil human passions, *e.g.*, anger and revenge, and, therefore, may be malevolent. But they possess also the good feelings of generosity and gratitude. They are, therefore, within reach of influence, and may be benevolent. Their possible malevolence is to be deprecated, their anger placated, their aid enlisted.

Illustration of malevolence in their character has already been seen in the dread connected with the ceremonies for the dead and at funerals. The similar dread of graveyards in our civilized countries may rest on the fear inspired by what is unknown, simply because it and they are unknown. But, to superstitious Africa, that unknown is a certainty, in that it is a source of evil; the spirit of the departed has all the capacity for evil it possessed while embodied, with this additional capacity, in that its exemption from some of the limitations of time and space increases its facilities for action. Being unseen, it can act at immensely greater advantage for accomplishing a given purpose. Natives dying have gone into

the other world retaining an acute memory of some wrong inflicted on them by fellow-villagers and have openly said, "From that other world I will come back and avenge myself on you!"

In any contest of a human being against these spirits of evil he knows always that whatever influence he may obtain over them by the doctor's magic aid, or whatever limitations may thus be put on them, they can never, as in the case of a human enemy, be killed. The spirits can never die.

Sometimes the word "dead" is used of a fetish-amulet that has been inhabited by a spirit conjured into it by a native doctor. The phrase does not mean that its spirit is actually dead, but that it has fled from inside of the fetish, and still lives elsewhere. Then the native doctor, to explain to his patient or client the inefficacy of the charm, says that the cause of the spirit's escape and flight is that the wearer has failed to observe all the directions which had been given, and the spirit was displeased. The "dead" amulet is, nevertheless, available for sale to the curio-hunting foreigner.

ON THE ORIGIN OF FIORDS.*

BY

GEO. D. HUBBARD.†

SECTION III.—Our present knowledge of fiords did not come all at once, but is the result of a steady accumulation of material relating to their features. Obviously, then, theories for the explanation of the origin of fiords show a development as well. The earlier explanations were based on the facts then known, and when further investigation revealed facts and relations formerly unknown the old theory became inadequate and a new one superseded it.

In the early study of fiord-form the fact of the great depth of the channel beneath the surface of the sea, coupled with the idea that rivers cannot cut channels much below sea-level, led to the supposition that the fiord channel was once a river valley of the land which had been submerged, allowing the sea to flow in for miles and drown it. Then, a more careful study of the channel floor, both beneath the fiord and up the channel, where the bottom is exposed, led to grave doubts as to the power of the river to cut a channel with such a floor. With this more detailed study came a theory supposing the fiord channel to be a "graben" or depression due to faulting and the dropping down of a block of rock. If faults are the cause of fiords they must be recent, because the fiords are in channels made since the last great uplift; channels which have been cut down below the erosion surface then uplifted, and now represented by the uplands. The fiords are so recent that their bare walls are scarcely weathered at all, and possess very little vegetation. Usually they are covered with scratches and grooves and have square shoulders, neither of which has yet been destroyed by disintegration. Faults in Norway are known to be ancient—much older than the last great uplift and the previous cycle of erosion which made the present upland surface. Again, if faults be the cause, they must accord with the drainage systems, because the fiords almost universally do. It is scarcely supposable that a system of faults whose origin is deep-seated should correspond with the watercourses of the surface topography. In Norway the faults do

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* Continued from page 337.

† This paper was prepared as a thesis in geography under Prof. W. M. Davis, at Harvard University.

not agree with the drainage systems. These two objections to the theory of fiords by faults are just as strong in Scotland and Labrador as in Norway. Moreover, fiords are wanting in many other regions where faults occur abundantly; and fiords sometimes occur where faults are unknown. True, great faults occur in one arm of the Christiania fiord, Norway; but this arm is not so fiord-like as the other, where both walls are alike of hard gneiss.

Fiords have been thought to be specially dependent upon strong relief, upon high latitude and great snowfall. To these suggestions it has been answered that fiords do not occur in all regions having these characteristics; nor do all fiord regions possess these features. All fiords occur in regions recently glaciated, which may suggest a relation between glaciation and fiords. Direction of mountain ridges, with reference to coast-line, folding of strata, and rock texture and composition, has also been thought to furnish necessary conditions for the production of fiords. A reference to the following facts will show the weight to be attached to these elements. The rocks of the Norway fiord region are mostly Archean gneisses; of Sweden, Silurian strata overlying similar gneisses; of northwest Scotland, Archean schists. The western coast of Greenland is known to be Archean gneiss; while Disco Island is Cretaceous. Labrador and the southern part of Baffin's Land are Archean, but the northern part of the latter is Carboniferous. On the Pacific coast of North America the fiords occur in Mesozoic and Tertiary rocks. Penck* thus sums up his discussion: "Fiords occur in faulted rocks in Norway, Scotland, and Greenland, and in folded rocks in Patagonia, British Columbia, and New Zealand." Some occur in crystallines, some in sedimentaries; some where mountains are parallel to the coast, and some where they are transverse to it.

Another theory which has existed a good many years, and which has recently been gaining much more general acceptance, is that of glacial erosion by ice streams. Fiords were first ascribed to ice work in 1827 by Esmark; but the theory was considered absurd at that time, because the work was deemed too great for the agent. Later studies have led to the conclusion that ice-covered Greenland explains Norway; while exposed Norway explains Greenland. It has been pointed out by more than one observer that fiords are confined to regions recently glaciated. They are features of coasts in high latitudes, and are best developed in coasts of strong relief which have been at some time subjected to glacial conditions.

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* Morph. der Erdoberfläche, 1894, II, 564.

A hasty glance at a little calculation, based on observations in regions of flowing stream ice, will help to elucidate the problem, and some comparative study will show the application of the glacial theory to it. In Muir Inlet, Alaska, the ice front of Muir glacier rises in a palisade two hundred feet above the water, and a short distance in front of the ice the water has a depth of seven hundred and twenty feet. If we calculate that a block of glacier ice floats in sea-water with one-sixth* of its volume above water, the two hundred feet of ice in view is more than enough to hold the seven hundred and twenty feet below water. On the supposition that the water does not shallow from the sounding to the ice front, the total thickness of the ice will be nine hundred and twenty feet, and the ice will rest on the bottom with a weight equal to a sheet of ice fifty-six feet thick, or about twenty-eight hundred pounds per square foot. If the water has shallowed towards the ice front the load on the bottom of the channel is greater. Russell† finds evidence that the ice has been much thicker here, and has extended farther seaward. He finds erratics on the flanks of bordering mountains two thousand feet above the present ice surface. The entire weight of this added thickness would be added to the calculated weight, and, with sea-level constant, would give a total pressure of over one hundred thousand pounds per square foot. Arm this ice with pebbles and boulders on its under surface and you have a rather formidable agent of erosion. After this glacier had cut a channel twenty-two hundred feet below the present sea-level it would still rest on the bottom with a weight of fourteen thousand pounds per square foot, and if still in motion would have considerable cutting power. If the land were somewhat depressed, that would prevent a part of the cutting calculated above, for it would allow the water to float up the ice; but if the land were at a higher stand the pressure would be greater and the power to erode would be increased. Probably at a sufficiently great pressure the ice in the lower layers would be softened or melted by pressure, and thus be unable to hold its tools.‡ Two questions arise—(*a*) At what pressure would it melt?

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* This proportion is taken because much glacier ice is not compact, and because sea-water, into which it extends, is saline—hence of greater density than fresh water. If it be thought that the true proportion should be 1:8 or 1:9, on account of greater assumed density for ice, or because of detrital material in the ice, that will make the first figures still more convincing.

† Glaciers of North America, 1897, 90.

‡ Experiments have demonstrated that a pressure of one atmosphere will lower the melting-point of ice 0.0135° F. Then 75 atmospheres, or about 158,000 pounds per square foot, would lower it one degree. This pressure, on the basis of the data used above, is equivalent to a thickness of 3,000 feet of ice.

This depends on its temperature, which is believed to be only a few degrees below the ordinary freezing-point. (*b*) If a change due to pressure occurs, would the ice become so fluid as to be unable to hold its tools, or would it simply become more plastic? If the temperature of the lower layers of ice be more than one or two degrees below the normal freezing-point, the second question need not concern us, because no such thickness of ice is required for the postulated ice erosion as would be necessary to fuse by pressure those layers at the bottom.

There are two processes to account for the uneven floor of the channels, both of which have probably played their part.

1. If the ice-tongue ran out to sea, nearly to the edge of the continental shelf, there would be formed a channel beneath the sea leading out as far as the ice-tongue had power to cut. This prolonged submarine channel is sometimes found. If the supply and waste maintained such a relation that the glacier could get no farther than the inner mouth of the fiord, obviously the channel would cease at that point. Since the glacier usually wastes and becomes smaller, the farther it flows from the supply, the end would be unable to cut as deeply as the portion a short distance inland, and would form a gently rising swell at the entrance to the channel. This, as pointed out in the description of Section I, is just what is found in the mouths of most fiords. A rapid recession, followed by a long stand at another point farther inland, would leave another sill deeper in the channel, with a basin between it and the former sill. Should the retreat and prolonged stand alternate, a series of swells and basins might be left all along the channel.

2. Again, if the ice encountered variations in the resisting power of the rock floor and walls, it would cut a depression in the weaker places, and leave transverse swells or sills in the stronger ones. On its final retreat, inequalities would remain the entire length of the channel, as so often observed in the landward portion beyond the head of the fiord. When a depression is started, the ice becomes thicker over it, because the upper surface of an ice stream tends to become rather uniformly graded. With increased thickness comes increased weight and decreased velocity. These changes may proceed until the ice ceases to move and erode in its lower layers. The scratches up the slopes of many deep basins, now exposed, indicate that the ice can pass, and has passed, out of them.

When a tributary glacier comes into the master ice stream the load on the bottom of the main channel is increased; consequently,

at the confluence of two fiord channels a deeper basin may be expected. Several such have been noticed by explorers. In a general way the broad part of a channel is shallower than the narrow part. For a similar reason the shallow side at a bend in the channel is on the inside.

According to Playfair's law, tributary streams of water enter the master stream by nicely-adjusted valleys, none of them too high or too low. Observation confirms the statement so far as the surface of the water in mature valleys is concerned, for at the mouth of the side stream the water surface of each is at the same level. But if the water be withdrawn from the channels it is equally evident that the bed of the smaller channel is somewhat above that of the larger one. This is necessarily so, because the little stream can only cut the channel deep enough to bring its own surface to the level maintained by the water of the master. Confluent streams, then, while having their surfaces and valley floors adjusted to the same level, will have discordant channel floors or beds. The amount of discordance will be an expression of the ratio of the volumes of the master and tributary streams, and a function of their respective drainage areas and run-off.

A glacier system in a mature state has its side streams entering the master stream, with their upper surfaces at accordant levels. If the master stream is a thousand feet thick, and the tributary has a thickness of two hundred feet, it is evident that the side stream cannot cut its channel deeper than two hundred feet below the common level of the uniting streams, while the master will have cut one thousand feet below the same level. It then appears that the floor of the side channel will be eight hundred feet above that of the trunk channel. A nice problem for study, and one pertinent to the subject of fiord origin, is to determine whether this discordance bears a definite relation to the drainage areas and to the precipitation on them, as seems to be the case with rivers. While the streams of ice, like water streams, seem, when flowing, to unite in nicely-adjusted channels, they are discovered to have been in discordant channels if the ice and water be removed. The discordance of channels, together with the usual evidence of glaciation —bare, scratched rock surfaces and erratics—is a very good demonstration that stream ice gave to the channels their present form and relation. The form of relief in fiords is that to be expected where ice streams have worked; and water is unable to produce such topography.

It has long been supposed that the only reason a fiord channel

contains sea-water is because of submergence of valleys carved in the land. Since ice can erode extensively below sea-level, we need postulate no depression to explain the present land and water relations in fiord regions. In fact, fiords cease to be evidence of submergence if they can be formed in some other way. Aside from the apparent drowning, the proof of submergence is very insufficient in fiord regions. Elevated beach-lines and sands are often found several hundred feet or less above the present shore-line, probably indicating a recent lower stand of the land. An elevation is more expectable since the retreat of the ice than a depression, because the quantity of ice, which all believe existed in these regions, would have a tendency to depress the land. Its melting and removal would have permitted the land to rise again. Owing to the great thickness of the ice, sinking, unless very great, would not remove the power of the ice streams to erode the channels. Beach-lines, now high above the present shore-line, may furnish evidence of emergence in recent times.

The cause of the failure by some to recognize fiords as results of ice work is twofold—first, we were unwilling to ascribe such enormous results to glacial erosion; second, we failed to comprehend thoroughly the relation of channel to valley in the case of both water and ice streams. Henry Gannett, of the United States Geologic Survey, furnished suggestive notes on this relation in 1898. It is stated by Davis.* After calling attention to the fact that in each case the channel is that part of the valley occupied by the moving stream, and that the water stream moving rapidly occupies but a very small part of its valley, while the ice stream, moving slowly, occupies a large part of its valley, he says: "A river has a channel with a broadly U-shaped cross-section at the bottom of its V-shaped valley, . . . and . . . a glacier has a V-shaped valley above its U-shaped channel." The fiord valley, so called, is in very large part an ice stream channel, but usually it spreads out above into a V-shaped valley. Believing the fiord to lie in a part of an old ice channel which may open out either into an ice valley or an old river valley, high up, where its walls flare more rapidly, the term "fiord channel" has been constantly used in the present article. This channel is not a valley in the sense that it was made by the stream or body of water that now occupies it. And, if made by an ice stream, the part in which the body of ice lay is not a valley, but is the channel of the ice stream.

The valley of an ice stream possesses parts analogous to those

* Glacial Erosion of the Ticino Valley, Appal., 1900, IX, 154.

of a river valley, and has them similarly disposed. The floor of the ice channel is uneven in a marked degree; this feature has its analogue, though less conspicuously displayed, in the depressions in the bed of a river which contain pools of water when the stream is so near dry that the water is no longer continuous. The floor or bed of a mature ice channel leading to the sea lies below sea-level at its mouth, provided, of course, that there have been no changes of sea-level since the forming of the channel. So the bed of a mature river, under the same conditions, is below sea-level at the mouth. In the case of the ice channel the depth is as great as the ice can erode it before the water floats the ice. The depth of the floor of the river channel at its mouth is a function of the width and discharge of the river. It will always be sufficient to bring the surface of the outflowing stream approximately to sea-level. The relation of channel floors, of uniting streams of ice, as well as that of uniting river beds, was discussed on a previous page and the similarity indicated. Another resemblance between glacier channels and river channels is found in seeking the line of greatest flow. Both ice streams and water streams have the greatest depth line coinciding with the greatest flow line. Where one departs from the median line, the other follows. Therefore, in the bends of fiord channels, the greatest depth is outside of the centre, as in river channels.

It remains yet to discuss the relation of the fiord channels to preglacial valleys. Since the land had been elevated previous to the ice invasion—as shown earlier in the discussion of faults—there must have been valleys of some form at the close of preglacial time. But since it is impossible to determine just what the topography was over which the ice first crept, the absolute amount of ice work in the channels is indeterminable. We know there were folding of strata and faulting before the ice appeared, and its work has been superposed on the topography it found. A measure of the minimum ice erosion can be obtained from the present altitude of the hanging valleys. If streams flowing in them prior to the beginning of ice work entered the streams in the master valleys at almost accordant levels—an expectable feature of streams—the master channel has been cut down by the ice the amount of its present depth below the side channel minus the slight discordance belonging to the earlier water channels. To this may be added any cutting known to have occurred in the side valley during its occupancy by ice.

In the light of the foregoing discussion of the theory of glacial

erosion* as the cause of fiords, it appears that the results of previous dynamic processes were not causal in the history of the fiord, but have helped, hindered, or directed the ice in its work, and thereby have given many varieties of form to fiords. The channels were not formed by faults, folds, stream-work, and so on, but were formed in spite of these earlier phenomena. The tendency of the ice was to produce the typical fiord, but where it could not it made the nearest approach to the type. The ice, working on old valleys and mountains, was helped in places, sometimes handicapped, and usually directed by the previous topography; and if unable to make the typical fiord, it made fiord-like forms, now known as fiärden, shären, föhrden, and other less marked geographic features. The dynamic processes, once brought forward as causes of fiords, naturally drop into their proper places. The climatic factors, high latitude and heavy precipitation of snow as conducive to glacial phenomena, may be called secondary or more remote causes of fiords.

A Few Selected References on Fiords.

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* By glacial erosion the author includes all erosion accomplished by the ice, the tools held by the ice, and the streams beneath the ice charged with sediments.

A HANDBOOK ON MEXICO.

Mexico.—A Geographical Sketch, with Special Reference to Economic Conditions and Prospects of Future Development. Compiled by The Bureau of the American Republics. Washington, Government Printing Office, 1900.

It would be difficult to overestimate the benefits which the Bureau of the American Republics is conferring upon the trading and travelling community of the United States by the publication of such handbooks as the one under discussion at present. Our foreign trade development will naturally seek our sister republics of this hemisphere and the rich fund of information about the history, geography, antiquities, economics, governmental and industrial conditions, with the long and elaborate tables of statistics, cannot fail to prove of the very greatest value.

At the same time, however, the fact of the handbook being a compilation lays it open to the risk of error, both on account of the varying data and inaccurate nature of the original sources as well as mistakes in the translation of the Spanish and carelessness as to comparing what is written in one place with what is stated in another. For these reasons the mistakes found in all parts of the handbook constitute a very serious drawback to its usefulness.

Throughout it is rarely, if ever, that our doubts are put at rest as to whether the money cited is American gold or Mexican silver, nor as to what was the rate of exchange when the figures quoted were good. In the chapter devoted to the description of the States of the Republic, San Luis Potosi is omitted altogether. Among the many minor inaccuracies a cursory reading of the book reveals the following: From the list of bays worthy of mention (p. 8) Acapulco, probably the best natural [*i.e.* unimproved] harbour on the west coast is omitted altogether; on p. 10 the metals classified as *recently* found have in all probability been mined for over a hundred years; the statement as to the climate changing, p. 11, on account of the rapid destruction of the forests is open to grave doubt. It is a favourite subject for newspaper paragraphs; but it is doubtful whether the central tableland ever had forests to destroy. Others of the coast slopes are intact as yet; the close attention given by the Government to fish culture, p. 14, is a figment of the imagination; so far as we know the range to which Popocatepetl and Iztaccihuatl

belong, p. 55, is never called Sierra Nevada; the interpretation given to the name Tenochtitlan, p. 60, is wholly incorrect according to the best authorities; on p. 63, what is stated in regard to the railroads must come from a report 20 years old; the Central and the Interoceanic roads are omitted altogether, and, furthermore, the statements do not agree at all with Ch. XIV; the "Englishing" of the names of the railroads, p. 83, ought to be "Monterrey [with two r's] and Mexican Gulf"; Mexican Northern and Mexican National; the good wagon roads spoken of, p. 86 and p. 97, as existing between Colima and Mexico City and from Acapulco to the capital are imaginary, unless the roughest of mountain trails are to be called good wagon roads; the leprosy mentioned, p. 96, as common in the State of Guerrero, is probably a mild form of syphilide, common in all tropical lands; the International R.R., p. 101, does not touch the State of Mexico at all, but from Eagle Pass runs to Torreon; the Interoceanic has no track to Acapulco and probably never will have; in the railways of Michoacan, p. 104, no mention is made of the Michoacan and Pacific R.R.; the most important railroad of the State of Morelos, p. 106, the Mexico Cuernavaca and Pacific, is omitted; on p. 111 we should read Mexican Southern; the figures given, p. 153 *et seq.*, in regard to coffee culture are misleading, if understood as true of others than the most favourable localities; pulque is not a national drink but only of the tableland, p. 164, and, furthermore, it does not come from henequen; the statement, p. 220, as to the industrial awakening of Mexico coming from the depreciation of silver is doubted by many judicious observers; the surveillance of book entries, p. 221, by Government officials does not exist; the surveillance extends only to the investigation of whether each page has the stamp required by the Government law, or not; in Ch. XII no mention is made of the State and municipal taxes, which are excessive, and form a great drawback to the advance of the country; the Interoceanic road does not reach the Amacusac river, nor are there any stages for the principal towns in Guerrero; the State telephone lines of Guerrero, p. 294, are omitted; the settlement of Choctaw Indians near Zitácuaro, p. 312, does not exist, nor ever did; the papers mentioned, p. 316, as issued in the States are most of them occasional sheets, published in the interests of such-and-such a person for governor and devoted usually to bombastic eulogies of this candidate's many virtues, with bad poetry and insults and false charges made against the opposing candidate. Such sheets come out once a week and usually die in a few months; the missionary information, on p. 319, is not correct

in many particulars; in place of "white," p. 332, read "yellow" flag, and note that the rates quoted are in Mexican silver; adobe construction, p. 334, in the towns, except where it rains excessively, as in Jalapa, is universal, as is also the use of tiled roofs in place of azoteas, except in the towns of the tableland; the price of living, p. 346, is steadily advancing with the depreciation of silver.

The note on the pronunciation is a veritable curiosity of literature. Only foreigners new to the country pronounce the names as there indicated: Chihuahua is pronounced Chee-waw-waw, and not Chee-ooh-ah-ooh-ah; Coahuila is pronounced Coh-ah-weel-ah, and not Coh-ah-oo-eeh-lah; h in Mexican proper names is more guttural than the note would lead us to suppose.

The map at the end of the book is too old to be of any value. The railroads built in the last few years are not shown; San Cristobal ceased to be the capital of Chiapas in 1892, and Tuxtla Gutiérrez took its place. Tixtla has not been the capital of Guerrero since 1875, but Chilpancingo; there is no territory of Sierra Mojoda, while that of Tepic is wanting altogether.

In the printing of proper names there are many errors; Zumfanga should be Zumfango; Tuxla Gutierrez should be Tuxtla Gutierrez; Tlacotepec, p. 95, should be Tlacatepec; Tuxtla, p. 98, should be Tixtla; Pizcuaro, p. 105, should be Pitzcuaro; Tetecla (p. 167) should be Tetecala; Silas, p. 278, should be Silao, etc.

Considering, however, the difficulty of compilation, it must not be supposed that these errors detract from the helpful character of the book in aiding us to a better acquaintance with our neighbours of the Southern Republic.

Chilpancingo. GEORGE JOHNSON.

NOTES ON CLIMATOLOGY.

BY

ROBERT DE C. WARD.

THE CLIMATE OF THE HIGH PLAINS.—A recent report of considerable meteorological interest is likely to escape the notice of meteorologists because of its publication in the Annual Report of the United States Geological Survey. This is a monograph on *The High Plains and their Utilization*, by Willard D. Johnson (21st Annual Report, U. S. Geol. Survey, Pt. IV, Hydrography, pp. 609–768). The High Plains correspond to what is sometimes called, for convenience, the Central Plains region. They lie in an irregular belt about midway across the long eastward slope of the Great Plains. The High Plains have practically no drainage, the local precipitation being disposed of by absorption. They are virtually unscored by erosion. Climatically, they lie in the Subhumid Belt. These High Plains were in the '80's the scene of an interesting but pathetic struggle on the part of man to occupy the land for agricultural purposes. Because of insufficient rainfall, failure followed these attempts, and the region was almost completely depopulated. Yet in spite of these discouraging pages in the recent history of the region, the High Plains are still an alluring body of unoccupied land, and will remain so until the best means for utilizing them have been devised. These lands are flat and fertile, and their annual rainfall at intervals is sufficiently heavy to make agriculture a paying investment of time and money. If farming is to be permanently profitable, however, experience has clearly shown that irrigation must be resorted to; and it is the purpose of Mr. Johnson's paper to show that, except to an insignificant extent, the High Plains cannot be irrigated so as to be reclaimable for general agricultural purposes, either from streams or from underground sources. Water is, however, obtainable from under ground in sufficient quantity to enable the entire area to be reclaimed for other uses than agricultural. This reclamation has already been begun, and it will be universally profitable. The problem is one of well-making, and of the proper location of wells, and then, by means of windmills, these Plains can be reclaimed from their present unprofitable condition and be successfully utilized as cattle ranges. This is to be the future of the High Plains.

The chapter of greatest interest from a climatic standpoint is the third, which deals with the *Deficiencies of Climate.* In this the reader will find an excellent presentation of the climatic characteristics of this interesting region. The climatic deficiencies of the High Plains as compared with the northwest are thus summed up: (1) The summer rains on the plains are violent and of brief duration, as a rule, rather than gentle and long-continued, as they commonly are to the north; (2) secular variation from the normal precipitation works greater harm; (3) the normal summer temperature is notably greater; (4) the relative humidity is notably less; (5) there are more hours of sunshine; (6) there is more wind, which, during the summer, is prevailingly from the south, is warm, and, therefore, has a drying effect, whereas during the same season in the northwest the prevailing winds are northerly; and (7) it is found that, as an effect of the brief ponding rains, the high temperature, the low relative humidity, the almost uninterrupted sunshine, and the persistent high winds, evaporation is greater in a marked degree. This chapter contains the best discussion of the climate of the general region in which the High Plains lie that has been published. The report as a whole, while largely geological and geographical in character, is full of interest to the climatologist, emphasizing as it does the control exercised by the climatic conditions of the Plains over the settlement of the region and the occupations of its inhabitants. There ought to be many more studies of this sort along the lines of human climatology and of human geography.

FORESTS, SNOW, AND IRRIGATION.—Increasing attention is being paid to the study of the amount of water available for irrigation purposes in those parts of our country where the rainfall is deficient, as, for example, in the High Plains region just alluded to. In connection with these irrigation problems a question of the greatest importance is the amount of snowfall on the mountains of the semi-arid region, and of the conditions of melting of this snow. In a recent paper on *Forests and Snow* (Bull. 55, Colo. Agric. Exper. Sta.), Professor L. G. Carpenter gives the results of an investigation made by him in the mountains of Colorado in the summer of 1900. The mountain streams in the early irrigation season are largely supplied by melting snow, and there is a marked diurnal fluctuation, which results from the daily variation in the rate of melting, and which disappears when the weather in the mountains is cloudy. It is interesting to note that the decrease in flow during the cloudiness, associated with continued rain, is so great that

it usually more than counterbalances the gain from the rain. A forest cover protects the snow, and the greater the amount of this cover the more uniform is the flow of the streams throughout the day and the season and the later the stream maintains its flow. Professor Carpenter concludes that the preservation of the forest is an absolute necessity for the interest of irrigated agriculture. The paper is illustrated by a number of half-tone plates, showing the forests with and without snow.

HANN'S LEHRBUCH DER METEOROLOGIE.—The newest text-book of meteorology, Hann's *Lehrbuch der Meteorologie* (Leipzig, Tauchnitz, 1901, p. 805), is one of the most important meteorological publications of recent years. Since Schmid's classical *Lehrbuch der Meteorologie* of 1860 there has been no attempt to bring out so comprehensive a book as that of Dr. Hann. The new *Lehrbuch* is a treatise rather than a text-book. It is an admirable compact summary of the present state of our knowledge of meteorological science. The references are copious, well selected, and given with great accuracy and completeness. As a bibliography alone the *Lehrbuch* is a valuable publication. The book will prove indispensable to every one who wishes the latest and best authority on meteorology, and it is a fitting companion volume to the same author's *Handbuch der Klimatologie*. It is a pleasure to know that an English translation of the new book is already under way; for this is a volume that should be generally used by English-speaking meteorologists and climatologists, as well as by those who are non-professionally interested in meteorology.

THE CAUSE OF GLACIAL PERIODS.—The question as to the cause or causes of glacial periods is old, but ever new. Before the British Association at Glasgow, Mr. H. N. Dickson read a paper on *The Mean Temperature of the Atmosphere and the Causes of Glacial Periods*, in which attention was drawn to the fact that any change that may have occurred in the mean temperature of the atmosphere was probably accompanied by changes in the temperature gradient between equator and poles, and therefore by modifications of the atmospheric circulation. It was suggested that this had not been sufficiently taken into account in discussing glacial and other phenomena connected with secular changes of climate. The probable effects of changes in the general circulation of the atmosphere upon the distribution of precipitation, and especially upon the position and direction of the tracks of cyclones, were examined,

and Mr. Dickson suggested that the greater proportion of rainfall received with easterly winds on the polar sides of cyclones, in lower latitudes than at present, may explain some peculiar features of glacial phenomena. In any case, the writer believed that these aspects of the problem deserve more attention than they have received. They indicate that the variations of temperature required to account for climatic changes are of smaller range than has been supposed, and they may, by the exclusion of some surviving theories, assist in determining the true cause.

PHYSIOGRAPHIC NOTES.

BY

RALPH S. TARR.

THE RIVER SYSTEM OF CONNECTICUT.—In the Journal of Geology (Vol. IX, 1901, 469) Professor Hobbs presents a portion of his results obtained in work for the U. S. Geological Survey in the Connecticut region (see 21st Annual Report, U. S. Geological Survey, Part III, 1901, pp. 1–162). His theme in this article is to show the relation between stream course and the joint and fault planes. Hobbs points out that the tendency of the modern school of physiographers seems to be to ascribe little importance to geological structure planes as a factor in determining the position and the orientation of water-courses. He calls attention also to the fact that at an earlier period there was a tendency to assign marked importance to this possible cause of stream course. He calls particular attention to the fact that the Norwegian geologists, Kjerulf and Brögger, find a marked relationship between stream course and fault fissures. In describing the south Norway region, Brögger, for example, remarks that, as a final result of his observations in the region, he finds that almost every valley, every cleft, is formed along a fault fissure.

With this introduction, Hobbs proceeds to a consideration of the Connecticut region, which he has studied with especial care in the Pomperaug valley. It is a well-known fact that the Jura-Trias (Newark) strata of the eastern United States are complexly faulted, and that these faults extend into the underlying and surrounding metamorphics, in which, of course, it is much more difficult to trace the faults than in the areas of sedimentary strata. The detailed study which Hobbs has given to the Pomperaug valley

> has developed the fact that a complex system made up of intersecting series of parallel, nearly vertical, joints and faults there divides the crust into a large number of orographic blocks, the smaller of which have dimensions of less than one hundred paces.

He further remarks:

> It was found in studying the area that the streams, large and small, for considerable distances adhere with great fidelity to the directions of some of the prevailing faults, and that in many cases, after being diverted from them, it was noted that they had returned persistently to the old direction. This correspondence of drainage lines to geological structure planes is far too close to be accidental.

Extending the study beyond the limited area, which he has examined carefully, Hobbs has traced maps of the Connecticut drainage from the United States Geological Survey charts, and upon them marked a theoretical extension of the fault planes observed in the Pomperaug area. These maps certainly develop a striking orientation of the streams in coincidence with the theoretical direction of the faulted areas. But the weak points in the paper are the failure to consider other explanations, such as superimposition, and the extremely hypothetical nature of the evidence outside of the Pomperaug valley.

The peculiarities of the drainage of southern Connecticut have long been a puzzle to physiographers, but Hobbs's study furnishes us a possible explanation of this peculiar drainage. His hypothesis is well worthy the careful consideration of physiographers; and if further detailed study of crystalline rocks of Connecticut reveal as close parallelism between stream course and structure planes as seems to be the case in the Pomperaug valley area, it will introduce to physiographers an element which many of the American school have been quite apt to consider unimportant. The lesson supplied by the Far West and elsewhere has tended to lead us to believe that fault plains have had very slight influence on stream course; and it will require very complete evidence to offset this view. Abundance of joint planes, on the other hand, are known in a number of cases to have had an influence on the direction of stream course. Is it not perhaps the influence of joint planes rather than of faulting that accounts for the phenomena to which Hobbs has called attention?

Recent Papers by Professor Davis.—In a paper read before the 7th International Geographical Congress in 1899 (Sonderabdruck aus den Verhandlungen des VII Internationalen Geographen-Kongresses in Berlin, 1899, pp. 221–231) Professor Davis makes a clear statement of his views upon the geographical cycle, which are so well known to American students. One of the important points which he makes in this paper is that geographers, in their studies which accompany travel, should add to mere description an appreciation of the scientific aspects of geography. This point he states in the following words:

> Geographers have been too long content to work without the aid of the faculties of imagination, invention, deduction, and verification, whose exercise has been found so highly advantageous to the progress of other sciences. If the adoption of the scheme of the geographical cycle will lead the geographer to think more it will certainly not cause him to see less. Owing to a too great reliance on observation alone,

geographers have left to their allies, the geologists and the biologists, who are more skilled in methods of scientific investigation, the discovery of the two most important general principles that are to-day involved in geographical study ; one being the evolution of land-forms and the other the devolution of organic forms. Is it not, then, now incumbent, on geographers at least, to make active application of these principles and of the methods by which they were discovered ?

As a fair example of the kind of discussion which the foregoing paper proposes, reference may be made to Professor Davis's own paper describing an excursion in Bosnia, Herzegovina, and Dalmatia (Bulletin Geographical Society of Philadelphia, Vol. III, No. 2, Feb., 1901). This paper is a popular description of an experience which Professor Davis had in 1897 on an excursion with Professor Penck of the University of Vienna. It is as interesting as most accounts of travel, though lacking the grotesque features which so often mar such attempts at scientific description. Yet, notwithstanding its interesting and popular nature, the paper is full of valuable information and deduction from scientific observations.

Another illustration of Professor Davis's method—far less popular, however, but of its kind a perfect illustration—is his recent paper describing An Excursion to the Grand Canyon of the Colorado (Bull. Museum Comparative Zoölogy, Vol. XXXVIII, 1901, pp. 107–201). It is difficult to summarize Professor Davis's careful analysis; but, in general, it may be said that he agrees in the main with the conclusions of earlier workers, though differing from them in his interpretation of some of the minor details. He also finds from his study that some of the interpretations of observed fact are not necessary. One important result of his study is his statement of the evidence indicating that the Colorado is not in any marked degree an antecedent river, but rather one of consequent origin. In this connection he says:

> The Colorado itself may be in part antecedent to some of the many dislocations that the district has suffered, but it seems to be for the most part consequent on the displacements caused by faulting in the later part of the great denudation, and on the form that the surface had assumed at that time.

Professor Davis notes the bearing of certain facts in the Colorado Cañon on the question of glacial erosion. He and others have held that side valleys, tributary to a main stream, and entering at a higher level, are in the case of the Alps, Norway, and some other regions indication of glacial erosion. These high-level tributary valleys have been given the name of *hanging valleys*. Some students of the subject have held that these hanging valleys are the normal result of the more rapid deepening of the main valley by the larger stream, thus leaving the tributary valleys behind in the work of

erosion, so that their bottoms are now high above the bed of the main stream. Professor Davis pointedly says that if this view is correct,

> then, surely, the discordance of side and main valleys ought to be very strong in the Grand Canyon, where there is no question of glacial erosion, where the disparity of volume between trunk river and side streams is notoriously great, and where the main valley is still so young that no significant widening of its floor has been yet accomplished. Yet, singularly enough, the side canyons of the Colorado join the main canyon at accordant levels in nearly all cases.

We have come to expect from Professor Davis the introduction of new geographical names and descriptive terms in his publications, and in the paper under consideration this expectation is not disappointed. While most of his terms are sound and descriptive, it seems to some physiographers rather questionable whether new names are not multiplying with altogether too great rapidity. Already the time has come when no one but a trained physiographer can read the literature intelligently. There is actual need of a glossary of physiographic terms. The introduction of this great mass of names must tend to interfere with the very object which Professor Davis has in his appeal to geographers to adopt more scientific methods, for it is plainly evident that without an extensive reading of the whole literature the new physiography, with its varied terms, is almost inaccessible to the geographer. No one will question the desirability of introducing a new term when one is actually demanded, but to introduce them in advance of such a need, as Professor Davis has done in his diagram on page 193, really seems uncalled for and of questionable value. Even a trained physiographer, unless he has a strong leaning toward classification, must recoil from the task of learning the proper use of the following names, which are marked in Professor Davis's diagram, fig. 17, page 193: Splitting ravine, peak-headed ravine, saddle-headed ravine, ridge-headed ravine, left basal ravine, right basal ravine, right side ravine, forking valley, split spur, tapering spur, terminal spurlet, right side spurlet, right basal spurlet, sprawling spur, left basal spurlet, mid-basal spurlet.

Origin of Structure of Basin Ranges.—According to Gilbert, Russell, and others, the Basin Ranges owe their peculiar forms in large part to faulting; but some workers, notably Dana, have dissented from this view, which is based largely upon physiographic evidence. Spurr (Bull. Geol. Soc. Amer., Vol. XII, 1901, pp. 217–270), basing his conclusions on a study of the literature and of parts of the field, strongly dissents from the common interpretation of

faulting, for he does not see in the physiography of the region sufficient proof that the form is to be ascribed to this origin. Instead of persistent monoclinal ridges he finds that the mountains almost invariably merge into folds. Faults that are ascertainable, according to his views—that is, faults in this region that are proved by stratigraphic evidence—are not, in general, associated with mountain fronts. In fact, where faults are present near the mountain front they are rarely attended by fault scarps, but, on the contrary, the steep mountain faces appear to be due to erosion. From his studies he considers the features of the Basin Ranges to be natural and normal results of erosion of the folded rocks. Their present form is the result of denudation, which has been in operation since Jurassic time. The older faults of the region are obscured by erosion, and new ones only are expressed in the topography.

The question which Spurr thus raises is most interesting, and worthy of careful future study. It is evident from what he has to say that the work of previous observers in this region has not been published in sufficient detail to support the broad conclusions which have been drawn from it with force enough to convince the writer of the paper. The reconnaissance nature of the work done in this field may, perhaps, account for this difficulty. It seems fairly certain, however, that there has not been a sufficiently critical study of the physiographic evidence to warrant the acceptance of faulting as an established explanation. But further than this it seems impossible to go; for, as Professor Davis has clearly and vigorously stated in his review of Spurr's paper (Science, Vol. XIV, 1901, p. 457), Spurr, on the other hand, has equally failed to establish his own thesis, because he has failed to discuss critically, and disprove the evidence of, a physiographic nature which previous observers have put forth. In fact, he does not appear to have a proper appreciation of the independent value of physiographic evidence, since faults inferred by such evidence are not considered by him as having proper foundation. There ought, in America, to be no question at this time concerning the value of purely physiographic evidence. Doubtless in the enthusiasm for this youngest branch of geology its votaries have in some cases made it carry too heavy a burden; but these are merely mistakes of individuals. The principles of physiography itself have become so well established that when a discussion is undertaken in which some of the facts are in the nature of physiographic evidence, it has come to be necessary to consider them as carefully as if they were stratigraphic or petrographic evidence. It is in his failure to recognize this fact that

Spurr's paper is weak; and it is because of this weakness that his conclusions cannot be accepted as proved. They may be correct, but further consideration of the physiographic evidence is necessary before his contention can be considered established.

LANDSLIPS IN NORWAY.—Reusch (Norges Geologiske Undersögelse, No. 32, *Aarbog* for 1900) describes some interesting landslips which occurred in Norway some years ago. In the Vaerdal landslip of May, 1893, in which fully 55,000,000 cubic metres slid into the valley of a small stream, the stream had been cutting against a clay bank in which there was "quick" clay beneath the soil. The action of the stream in lateral erosion caused numerous small slides, and the movement culminated at midnight on the 19th of May with the great slide, which killed 111 people and dammed up the stream, forming a lake with an area of three square kilometres. In the same vicinity a great landslide occurred three years before.

Farther up stream, in the same year, there occurred a peculiar change in the river. At one point the stream was flowing in a cut over rock at the base of which it turned sharply at right angles, cutting against a bluff of marine clay, which separated the lower course of the river from the upper course above the rock barrier. By cutting and weathering, the clay barrier between the two sections of the stream was so lowered and narrowed that there was evident danger of the stream taking that channel and abandoning its rock valley. In consequence of this danger it was proposed to strengthen the clay barrier; but before anything was done, during a time of flood, the water in the upper course of the river spilled over the clay divide, at first as a tiny stream, then, in the course of an hour, as a roaring, muddy torrent, which quickly cut so deep into the clay that the rock section of the valley was abandoned. This, of course, lowered the grade of the stream, which had previously been held back by the rocky barrier, and the river began rapidly to deepen its valley up stream, and, at the same time, the side streams near their mouths began to cut narrow gorges in the clay beds. The result was that in a short time the old broad-bottomed valley was transformed to a cañon, and the side valleys became young in form. By pictures and a series of drawings Reusch illustrates the development of the cañon condition up stream; and one picture shows strikingly what a tremendous change took place where, in order to pass from one side of the valley to the other, instead of going by even grade as formerly, it had become necessary to travel across from

one side of the old flood-plain to the other in a cage suspended from wire ropes. With this rejuvenation of the stream valley, owing to the steep slopes, numerous landslides naturally occurred as the clay slipped, and by this means farms were destroyed and roads ruined. Reusch points out that this case well illustrates, on a small and rapid scale, what would happen in the elevation and consequent rejuvenation of a stream system upon a coastal plain.

Some Topographic Features of Norway.—In the same *Aarbog*, in which the above account of landslides is given, is an interesting interpretation of the topography of portions of Norway. There is much detailed description of individual fjords, valleys, and falls, accompanied with interpretation of their origin and illustrated by numerous clearly-made sketches. The high plateaux are interpreted as peneplains, not being due to marine denudation, as is the case in some of the lower coastal plains, such, for example, as that near Bergen.

Of the many sounds, inlets, etc., near Bergen, some are due to the action of the sea, and many of them owe their position to structure and joint planes. In accounting for the fjords, Reusch agrees in part with Professor Davis, that the hanging valleys which enter on the side, at levels well above the fjord bottom, and even, in some cases, fully half a mile above the present sea-level, are an indication of glacial erosion; but he states that he cannot agree that the fjords have been entirely formed by glacial erosion. Norway was once apparently higher than at present, and water action must be in part invoked to account for the phenomena. Some fjords show signs of complex origin, in which interglacial water erosion and several periods of glacial erosion are involved. The glaciers, in moving down these valleys, not merely enlarged them but also partly destroyed the side valleys by wearing back the sides of the main fjord valley.

Owing to the rather full English summary that is in the back part of the volume, these physiographic and geological articles are rendered accessible to English-speaking students.

The Andes of Patagonia.—Partly due to the attempted settlement of the boundary dispute between Chile and Argentina, the literature on the hitherto little-known Patagonia has of late been decidedly increased. One of the latest accounts of importance is by Gallois (Les Andes de Patagonie, Annales de Géographie, tome X, 1901). The article contains much interesting description of

surface features, and is illustrated by a series of splendid panoramas, in which are shown the grander features of topography—the rugged mountains, with their waste slopes and extensive snow fields and glaciers. It is also illustrated by a new map (1901, by Moreno), on which is shown the western boundary of Argentina. Upon this map the topography is shown by shading in such a way as to bring out clearly the rugged mountain chain to the west and the broad level plains of the east. It shows with marked clearness, also, the contrast between the regular eastern coast and the deeply-fjorded west coast.

A new series of maps, published in London, on Argentine evidence in the Argentine-Chilian boundary dispute, has just appeared. They portray, in a very clear manner, some of the larger features of the physiography of Argentina.

Niagara Falls.—Notwithstanding the already extensive literature devoted to Niagara Falls, the recent paper by Grabau (Bull. N. Y. State Museum, No. 45, Vol. 9, 1901) is a distinct addition, which will be greatly welcomed by large numbers of people. It is prepared

> with the special purpose of affording to visitors to Buffalo during the season of the Pan-American Exposition in 1901 a viaticum in their tours through this region, renowned for its scenic features and classic in its geology.

Owing to the object with which it is prepared, this paper is naturally a summary of our knowledge of the Niagara Falls region, gained as the result of the labours of large numbers of investigators. It is, however, more than this, for from a number of points Grabau introduces new ideas concerning the interpretation of the physiography of the region, as, for example, in his interpretation of the early drainage. His long acquaintance with the region has fitted him admirably for the task which he has undertaken. It happens that most workers in this region have looked at the Niagara problem from its physiographic standpoint, with the result that there is scarcely anything that is full and complete on the details of the stratigraphic aspect. It is in this direction that Grabau's paper is especially strong, and his description, with figures of the fossils of the Niagara gorge, will be found of great use to those who go to study in this region. One of the unique and extremely valuable portions of the report is Chapter V, by Miss Letson, upon the post-pliocene fossils of the Niagara River gravels. There is also a fairly complete bibliography of the Niagara geological literature.

THE ADIRONDACKS.—In a recent number of Appalachia (Vol. IX, 1899) Smyth has stated the main facts in the history of the Adirondack region. In the complex of rocks of this mountain group some are evidently altered sediments, others granites, syenites, gabbros, etc., of plutonic origin, greatly altered by metamorphism since their intrusion. Thus a gneissic banding has been introduced even in the igneous members of the series. Following the intrusion of the great bosses of plutonic rocks were apparently two periods of minor igneous activity—one pre-Cambrian, the other post-Ordovician. After the pre-Cambrian intrusion of dikes

> constructive action in the Adirondacks ceased for a long time. A period of profound erosion followed, laying bare the rocks which had been formed or metamorphosed, or both, as the case might be, at great depths in the earth's crust.

Concerning the condition of the Adirondacks in Cambrian time Smyth puts forward two hypotheses, from which he does not feel that the facts yet warrant a selection of either one as demonstrated. On the one hand it is possible that

> during upper-Cambrian time the Adirondack region formed a rugged island, rather smaller than the present area of crystalline rocks, and with a very irregular coastline. On the other hand, it is also possible that the region was reduced to low relief by pre-Cambrian denudation, and that the Potsdam outliers have been faulted into their present position.

PEARY'S PROGRESS TO THE POLE.

A lecture before the Society on Tuesday evening, Nov. 19, at Mendelssohn Hall, by Herbert L. Bridgman, Secretary of the Peary Arctic Club and in command of the *Diana*, 1899, and *Erik*, 1901, Expeditions. The lecture was fully illustrated by stereopticon views from new photographs, and the following is a summary of its more important features:

The rôle which falls to me this evening, ladies and gentlemen, is very simple and very old. Indeed, were I in a church, I might imitate the preacher and say, "You will find my text in such a chapter and verse," but, perhaps, as you may, like myself, be a little out of practice, I may make myself more easily understood by simply saying that I am a sort of herald come out of the North, forerunner of a man who, having already high honours and distinctions, will come, next year, to us deserving still greater praise, and bringing the great geographical prize of the centuries.

The situation, at the time of the departure of the *Erik*, on the 14th of last July, was, briefly, that two years, or, rather, two full seasons for Arctic work, had elapsed since anything had been heard from Lieut. Peary, and that an entire year had passed since the *Windward*, with Mrs. Peary and Miss Peary on board, sailed for the North, with the incidental knowledge that two years had also passed since any word had been heard from Sverdrup's Norwegian *Fram*. What had been the fate of these three expeditions? Whether all had gone well, or whether disaster had overtaken either, it was our business, if possible, to go and find out. Our destination, by common understanding, was Etah, Peary's North Greenland headquarters, where we of the *Diana* bade him farewell on that gray August morning in 1899, when we came down Foulke Fjord with flags flying and red lights burning, while the explorer and his little band of native allies from the rocks answered our cheers.

Leaving Sydney, the *Erik* dropped anchor next day at Port-au-Basque, Newfoundland, where, after three days' delay, our complement of men from St. Johns was obtained, and putting immediately to sea, we rounded Cape Ray Light at midnight of July 17. One fine day and another of head-winds brought us in the Straits of Belle Isle into the ice, much more to the south than any Arctic

ship since Peary's first *Kite*, in 1891, had met it, cutting off completely our hope of a Labrador port, and driving us far out to the eastward toward the middle of Davis Strait. Here we encountered the East Greenland stream, coming around Cape Farewell, driving us again to the north, so that with the worst of weather all the time we finally dropped anchor late on Saturday evening, July 29, in the little harbour of Disko Fjord.

The next morning being fine, we retraced our course to Godhavn, where Governor Nilsen informed us that they had no news of either Peary's or Sverdrup's ship, but that in March a steamer heading north had been seen far out in Davis Strait—which we all agreed might possibly have been the missing *Fram*. Remaining less than twenty-four hours in Godhavn, we were under way early on Monday, arriving on Wednesday at Upernavik, where Inspector Jansen and Governor Knauth greeted us, with no more information of Peary, and pushing at once into the ice of Melville Bay, after three days we woke, at midnight of Friday, August 2, with blasts of our whistle, the native settlement at Cape York. Taking on board a party of natives, we proceeded through the open north water, and at 6 o'clock on the evening of Sunday, August 4, had the satisfaction of dropping anchor alongside of the *Windward* in Foulke Fjord, under the rocky cliffs of Etah.

We found on the *Windward* the Peary family, Surgeon Dedrick, and Capt. Bartlett, with all the ship's company, all in perfect health and with an exceedingly interesting story of the experiences since they had been heard from. Lieut. Peary delivered in person the telegram and letters, of which copies follow, left by him with Surgeon Dedrick at Fort Conger in April last upon his departure for the North, with the expectation that the Doctor would bring them South and deliver them before Peary should return.

The telegram, published for the first time, is as follows:

U. S. Consul—Kindly cable immediately

PEARY.

CONGER, April 4, 1901.

BRIDGMAN,
Standard Union,
New York.

May, 1900, rounded north end Greenland 83 degrees 39 minutes. Down east coast to 83 degrees. North to 83 degrees 50 minutes. Stopped by broken pack. Wintered Conger. No news ship. Now starting North via Cape Hecla, Henson, one Eskimo. Doctor Dedrick remainder party going south find ship. All well. Letter.

PEARY.

* The letter to the secretary of the club read:

CONGER, April 4, 1901.

MY DEAR BRIDGMAN:

It gives me great pleasure to present to the Club the results of the work of 1900.

First—The rounding of the northern limit of the Greenland Archipelago, the most northerly known land in the world, probably the most northerly land.

Second—The highest latitude yet attained in the Western Hemisphere (83 degrees 50 north).

Third—The determination of the origin of the so-called paleocrystic ice (floe berg), etc., etc.

Considering that I am an old man, have one broken leg and only three toes, and that my starting point was Etah, I feel that this was doing tolerably well. It is almost 1,000 years since Eric the Red first sighted the southern extremity of the archipelago, and from that time Norwegians, Dutch, Danes, Swedes, Englishmen, Scotchmen and Americans have crept gradually northward up its shores until at last, through the instrumentality and liberality of the Club, its northern cape has been lifted out of the Arctic mists, and obscurity. It seems fitting that this event, characterized by Sir Clements Markham as second in importance only to the attainment of the Pole itself, should fall in the closing year of the century. If I do not capture the Pole itself in this spring campaign I shall try it again next spring.

My gratitude and respects to all the members of the Club. Always most sincerely,

PEARY.

The fuller report to the Club of the work of the expedition was in these words:

CONGER, April 4, 1901.

DEAR SIR:

After sending back the two natives from C. Britannia (C. North) May 4, 1900, I continued north along the Greenland coast with Henson and one Eskimo.

Lockwood's Farthest was reached May 8, and his record taken for the archives of the Club.

Cape Washington was reached on the next march, and the northern extremity of the Greenland archipelago, May 13, N. lat. 83:39 W. long. 33:20.

No land visible northward, but a water sky in the distance, as over a broad lead or pool.

From here proceeded due North to N. lat. 83:50, where I was stopped by disintegrated pack. Water sky not far distant.

Returning to north point of land proceeded eastward and southeastward down the east coast to 83 N. lat. (approx.) W. long. 25 (approx.). Stopped here by dense fog and severe storm. Fog continued for ten days.

Returning, Conger was reached June 10. Open water at Black Cape, Black Horn Cliffs, Cape Brevoort and Cape Sumner rendered our progress at times precarious.

Cairns and records were left in the highest known land in the globe, at the farthest known land on the east coast, and at Cape Washington.

Ten musk-oxen, one bear, one hare, were killed near the extreme northern point of the land. Thirty-two other musk-oxen, one wolf, several seals, two fresh bear tracks, and numerous ptarmigan were seen during the journey.

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* Printed in BULLETIN No. 4, pp. 366–7.

So-called paleocrystic ice, floe-bergs, etc., were observed in process of formation along the north coast.

During my absence Dr. Dedrick and the Eskimos had secured some thirty-three musk-oxen and ten seals in the vicinity of Conger; had established small caches for my return at Thank-God Harbor, Cape Lieber and Lincoln Bay, and had brought up sugar, milk and tea from the various caches between Conger and Cape Louis Napoleon.

July was passed by Dr. Dedrick with a portion of the Eskimos in the region from Discovery Harbor westward, via Black Rock Vale to Lake Hazen, where he secured over forty musk-oxen.

During August and early in September various other hunting trips of shorter duration were made, resulting in the killing of some twenty musk-oxen.

The middle of September I started with a party for Lake Hazen region to secure musk-oxen for our winter supply, it being evident that no ship would reach us. Going west as far as the valley of the Very River by Oct. 4, ninety-two musk-oxen had been killed. Later nine more were secured, making a total of 101 for the autumn hunting.

From the beginning of November to March 6 a large portion of the time was passed by the party in igloos built in the vicinity of the game killed in various localities from Discovery Harbor to Ruggles River.

In February Dr. Dedrick, starting on his way to the meat at Very River, was successful in killing nineteen musk-oxen at Ruggles River, rendering it unnecessary for him to go to Very River.

One of the Eskimo women died Jan. 13, and Henson showed symptoms of scurvy at the same time.

On the reassembling of the entire party at Conger March 6 (Dr. Dedrick had been living in the igloos since Jan. 2) the doctor pronounced every one showing symptoms of anæmia. This delayed my departure, which I had hoped would take place March 15.

March 19 I started for Ruggles River, returning to Conger March 22, with meat. March 25 Dr. Dedrick left to hunt musk-oxen in the vicinity of C. Beechy and Wrangle B., for use of my northern party. He returned April 1, having seen tracks only of the animals.

I start to-morrow with Henson and one Eskimo and twenty-four dogs for C. Hecla, or some favorable point in that neighborhood, from which I shall attempt to push north over the polar pack as far as possible. Dr. Dedrick at the same time starts south with the rest of the party to communicate with the ship.

On my return to Conger from the north I expect to follow him south, join the ship, and make every effort to push her as far north as practicable the coming summer. If disaster has overtaken the ship in her efforts to get north last season, I expect from D'Urville and Sabine as a base to devote my time next fall to work on the west side of Grinnell land, and it is quite possible that I may go north next spring along the west shore of that land on a route parallel to the now well-beaten Smith Sound group.

In continuation of my letter to you from Conger April 5 I note as follows:

April 5 I left Conger with Henson, one Eskimo, two sledges and twelve dogs for my northern trip. On reaching Lincoln Bay it was evident to me that the condition of men and dogs was such as to negative the possibility of reaching the Pole, and I reluctantly turned back.

Arriving at Conger, after an absence of eight days, I found the doctor and his party there. Leaving Conger the same time as I with six Eskimos, two sledges and

seven dogs and pups, in an attempt to communicate with or obtain news of the ship, the character of the traveling had obliged him to return before reaching Cape Lieber.

Fortunately the night before I arrived one of the Eskimos secured several musk-oxen above St. Patrick's Bay, which enabled me to feed my dogs before starting south, which I did with the entire party on the 17th.

April 30 at Hayes Point, I met the party from the *Windward* attempting to reach Conger, and received my mail, learning that the *Windward* was at Payer Harbor. After a rest at the D'Urville box house, I went on to the *Windward*, arriving May 6.

Dr. Dedrick remained at D'Urville with the dogs and two of the men from the *Windward* to transport supplies up the coast for the next winter's campaign.

After nine days' rest at the ship Henson started with five sledges to get the pemmican to Conger and return before the ice broke up.

May 22 Dr. Dedrick reached the ship. The transportation of supplies, principally dog food, to D'Urville, was continued to the middle of June, when everything then available was removed from Payer Harbor.

Henson established a cache of pemmican at Cape Defosse, but was unable to reach Conger on account of deep snow.

During June work was carried on upon the winter quarters, the *Windward's* deck house being transferred to the shore for that purpose, it being my purpose to utilize the Stein house for quarters for my Eskimos.

July 3, after several days' sawing, the *Windward* was freed from the ice, and at once steamed across to Littleton Island, where the Fourth was devoted to duck shooting. After this she proceeded to Whale Sound to hunt for walrus, 128 of these animals being killed and landed at Payer Harbor, but previous to the arrival of the *Erik*.

The subsequent movements of the ship are familiar to you, and do not need to be noted here.

Very sincerely,

R. E. Peary, U. S. N.

H. L. Bridgman,
Secretary,
Peary Arctic Club,
N. Y. City.

During the three weeks that followed, the work of the spring of 1900 was often recurred to, and many interesting facts and deductions were added by Lieut. Peary to his first statements. In his judgment, the journey demonstrates the termination of land, and eliminates completely Greenland from the Arctic problem. From the farthest North, 83:27, the coast to the east changes, and in place of the high, precipitous cliffs and deep fjords is a low, rolling foreshore, evidently the principal coast of the North. Lieut. Peary pointed out a very striking similarity between the coast to the east and to the west of Lincoln Sea, the characteristics of Cape Hecla being almost identical with those to the northern point and east, while those to the west of Cape Hecla are almost duplicated by those to the east of the point, running completely around to Independence Bay.

The story of Mrs. Peary's winter in the *Windward* was equally

interesting, though less important from a strictly geographical and scientific point of view. Reaching Etah late in August, 1900, Peary's orders to cross Smith Sound and proceed as far north as possible were found, and every effort was made to follow them. The ship was, however, beset by ice at Cape Sabine, and further progress made impossible. Winter quarters were established in Payer Harbor, and here for eight months Mrs. Peary and Miss Peary remained, ice-bound, imprisoned on the *Windward*, yet passing the winter with a fair degree of comfort. Miss Peary played on shore in the open air every day with her Eskimo comrades, and three unsuccessful efforts were made to reach Fort Conger and effect, if possible, a junction with Lieut. Peary. The last was successful to the extent that, coming south, Peary met the party April 30, 1901, at Cape Hayes, and pushing on, reached the *Windward* at 3 o'clock on the morning of May 6, his birthday. The *Windward*, with the aid of saws, freed herself from the ice July 3, her deck-house having previously been landed to serve as headquarters during the winter of 1901–02; and during July Peary had killed in Inglefield Gulf 125 walrus for dog-food for the next campaign, all of which had been successfully landed at Cape Sabine the week before the arrival of the *Erik*.

With the two ships in commission, the walrus hunt was resumed for a week, when Lieut. Peary, taking the *Erik*, proceeded to Cape York, and later made a round of all the native settlements, collecting dogs, skins, and equipment for the campaign of the spring of 1902. The hunting party in the meantime, in a deer-hunt on the promontory between Olriks and Academy Bays, captured thirty fine animals, whose skin and flesh were of the greatest service to Lieut. Peary.

The *Erik* returned to Etah, and having on board all of the fruits of the three weeks' walrus and deer hunts, and of the trading expedition with the natives, left Etah on Saturday night, August 24, for Peary's headquarters at Cape Sabine, only 23 miles distant. After a persistent but fruitless struggle with the ice, it was obliged to land Mr. Peary and his party in a temporary camp on the south side of Herschel Bay on Thursday, August 29. Here Lieut. Peary proposed to remain until the ice should either permit him to go in his boats ten miles north to his headquarters at Cape Sabine or until it should be frozen sufficiently to enable him to go over its surface to the same destination. In either event he was likely to be comfortably established for the winter within a month at the furthest from the departure of the steamer. The *Erik* crossed

Smith Sound with no great difficulty, and completed her voyage at Sydney, C. B., September 13, being followed by the *Windward*, with Messrs. Robert Stein and Samuel Warmbath, of the Ellesmere Land Expedition, which arrived at Brigus, N. F., September 29.

Lieut. Peary expected to devote the autumn of 1901 to the musk-ox hunt and to exploration of the western portions of Grinnell Land, which would occupy him as long as the light continued. It is quite within bounds that he may find Eskimos who have never yet been seen by white men, and an encouraging presage of that was the unmistakable indications of a former settlement on the site of his temporary camp on the south side of Herschel Bay. Mr. Peary is abundantly supplied with the best dog-food, and will undoubtedly have, when taking the field in the spring, the largest and best pack of dogs which he has ever had. Seventy are now with him, and the natives who will visit him as soon as the light returns will doubtless bring others. It is his clearly-defined and declared purpose to proceed along the coast from Fort Conger to Cape Hecla, and thence to lay a course directly and in an air-line over the sea-ice for the Pole.

As to the final outcome, Peary's own words are: "Given a favorable season next year, I regard myself in better shape for the realization of my plans than I have been any previous year of my stay here."

CENSUS RESULTS.

BY

HENRY GANNETT.

INTERSTATE MIGRATION.—The native population of the United States, in 1900, was 65,843,302. Of these, 13,863,651 were living in States different from those in which they were born. This is 18.2 per cent. of the total population of the country, and 21.3 per cent. of the native population of the country. In other words, of the native population more than one person in five had left his State of birth.

If to this number we add that of the foreign-born, namely, 10,460,085, we find that of the total population no fewer than 24,323,736 have moved either from the State or country of birth. This is very nearly one-third of the population of the United States. These figures bring out in strong relief the amazing mobility of the people of this country. Our States are comparable in area with the countries of Europe, and if these figures be compared with the corresponding ones in Europe, it will be found that our mobility is in the ratio of probably ten to one as compared with theirs. Of course, the conditions are not parallel, inasmuch as a movement from one country to another of Europe involves a change of allegiance, and in many cases of language, both of which are obstacles to freedom of movement.

Examining the figures of interstate migration by States, many curious and interesting phenomena are disclosed. The extent to which some of the older States have contributed to the peopling of the newer ones is very large. Illinois has sent out over one million of her sons; Ohio more than one million one hundred thousand, and New York more than one million three hundred thousand. Pennsylvania has sent out nearly one million, and many States have sent out over half a million each. Expressed in terms of the proportion which the number of emigrants bears to the total population of a State (which is perhaps a fairer way of expressing the situation, inasmuch as it takes account of the population of the State), we see that Delaware, Maine, Nevada, New Hampshire, Vermont, and Virginia have each sent out more than thirty per cent. Indeed, Vermont holds the highest rank in this regard, since her emigrants are nearly one-half her present population. The number of States in

which this percentage ranges between 20 and 30 is eight, while in most of the other States the proportion of emigrants exceeded ten per cent.

On the other hand, we find certain States receiving native emigrants in enormous numbers. Illinois received nearly a million; Missouri, 855,000; Texas, 838,000; New York, 534,000, and Ohio, 508,000. Expressing the number of native emigrants in terms of the percentage of the present total population of the State, we find that in Idaho, Indian Territory, Oklahoma, Washington, and Wyoming, more than one-half of the present total population were born in other States, and in Arizona, Arkansas, California, Delaware, District of Columbia, Kansas, Montana, Nebraska, Nevada, North Dakota, Oregon and South Dakota, more than 30 per cent. were born in other States.

The net result of this movement of population is in some States a gain, and in others a loss, most of those in the eastern part of the country having lost, and most of those in the west having gained, although this rule does not hold good in all cases. In New England the three States of Maine, New Hampshire, and Vermont have lost as a net result of the migrations of the native-born. They have not received from other States as many people as have gone out from them. In Massachusetts, Rhode Island and Connecticut, on the other hand, there has been a gain, and, in the first two, a considerable gain. New Jersey, farther south, has also gained; and this gain is doubtless due to development of the manufacturing industry, which has enabled these States not only to hold their sons, but to attract the sons of other States. New York, Pennsylvania, and all the southern States as far as Mississippi, with the exception of West Virginia and Florida, have suffered net losses, and in some cases very large losses, by interstate migration. In West Virginia the development of the coal-mining industry has doubtless enabled it to hold its own, while in Florida the prevalence of frontier conditions has had the same effect. Of these States, Virginia is the heaviest loser, the net result to her being a loss of no fewer than 455,422. She has sent out of her sons to aid in peopling other States 589,692, and has received from other States 134,270.

The States in the Upper Mississippi Valley, Ohio, Indiana, Illinois, Wisconsin, and Missouri have sustained net losses, while Michigan, Minnesota, Iowa, Arkansas, Louisiana, and all the States west to the Pacific coast have made gains. The net losses of some of these States are very great, as New York has lost 666,000; Ohio, 612,000; Kentucky, 335,000. On the other hand, the gains of some States

are enormous. California has gained 364,000; Kansas, 422,000; Oklahoma, 309,000, and Texas the enormous total of 629,000.

Adding together the number born in each State and still remaining there, and the number born in the State who have migrated from it, we obtain the total number of persons in the country who were born in each State, wherever living at the time of the census. The proportion of those remaining in the State and those who have left it is significant of the economic conditions of the State. The average proportion of migration to the total native population is a little over one-fifth, or 21 per cent., and we may assume that within five per cent. of this average the conditions do not differ greatly from those of the average of the country, and we may therefore consider only those States which depart more widely than this from the mean. Those States which have a low percentage of migration are Arizona and Texas with 9 per cent.; California, Florida, and Louisiana with 10 per cent.; New Mexico with 12 per cent.; Oklahoma and West Virginia with 14 per cent. Most of these will be recognized as frontier States. Florida falls in this category, as the southern half of the peninsula is almost unsettled, and settlement is pushing south gradually year by year. West Virginia is holding her sons because of the development of coal-mining within her borders. Louisiana is a peculiar case. In large part it is settled by a sedentary population of French origin; it contains also a large city with rapidly-increasing commerce.

At the other end of the scale we find Illinois, Indiana, and Virginia with 26 per cent. of migration; Maine and Ohio with 28 per cent.; Delaware and Iowa with 30; Kansas with 32; New Hampshire with 34; Wyoming with 35; Vermont with 41; and Nevada with 44 per cent. Among these States we find three different causes operating for the large emigration. The small States lose greatly in proportion, simply because of the size. One has to travel a less distance to get out of Delaware, New Hampshire, or Vermont than from larger States. Again, in Maine, New Hampshire, Vermont, Delaware, Virginia, Ohio, Indiana, and Illinois we have States which are quite fully populated for the prevailing industry—that of agriculture. They are States which are ripe for an industrial change from agriculture to manufactures, and in all of them that change is going on, but is in different states of progress in different States, and meantime these States are unable to hold their sons, who go forth to new and fresher fields. In Kansas the economic conditions have been much the same, but from a different cause. Settlement spread rapidly in the late 80's over the western

part of the State, induced by a series of seasons of heavy rainfall. Subsequent droughts depopulated the country and scattered settlers far and wide.

The excesses of emigration in Wyoming and Nevada are due, perhaps, merely to the restless character of their settlers; and in the latter State there is another element—the partial failure of the mines, which has resulted in an absolute reduction of its population.

The drain of native population from the northeastern States has been, in part at least, made up by foreign immigration; but the southern States have received no foreign immigration, and the drain upon them has been made up, when made up at all, only by natural increase.

Foreign-born Population.—The population of the United States in 1900 which was of foreign birth numbered 10,356,644, being 13.7 per cent. of the total population. The proportion was smaller than in 1890 by 1 per cent., owing, doubtless, to the diminishing immigration and the return of immigrants, on account of the prevailing depression in business.

The countries which have contributed most largely to the foreign element are as follows, with the number from each:

Germany	2,666,990
Ireland	1,618,567
Canada and Newfoundland	1,181,255
England, Scotland and Wales (Great Britain)	1,169,626
Norway, Sweden, and Denmark	1,064,309
Italy	484,207
Russia	424,096
Poland	383,510
Austria	276,249
Bohemia	156,991
Hungary	145,802
China	81,827

The above figures, together with those of former censuses, show that great changes are going on in the constitution of the foreign-born element of our population. We have statistics of each census since 1850. At that time the Irish formed the principal element, constituting not less than 42.85 per cent. of the total foreign element. This proportion has steadily diminished for half a century, until now the Irish form only 15.62 of the foreign-born element. In 1850 the Germans were second, with 26 per cent., and in 1860 they increased to 31 per cent., and held a proportion of about 30

until the last census, when their proportion has diminished to 25.75 per cent. The third element was the British, including natives of England, Scotland, and Wales, which in 1850 formed 16.89 per cent., or about one-sixth of the foreign-born element. That proportion has diminished quite steadily, until in 1900 it was only 11.29 per cent. Thus these three, the largest elements in 1850, have all diminished proportionately. The next element of magnitude was the natives of Canada, which formed in 1850 6.58 per cent., and now form 11.45 per cent.

In 1850 there were no other nationalities represented in any considerable number. The natives of Scandinavia — Norway, Sweden, and Denmark—formed less than 1 per cent., and they now form a trifle over 10 per cent., having increased continuously during the half-century. The Russians were very few in number, but now number over 4 per cent. Hungary was not represented at all, but now has 1.4 per cent., and Bohemia, which is first represented in 1870, now has 1.5 per cent. The Poles first appeared in the census of 1860, with a fraction of 1 per cent., and they now have 3.7 per cent. The Italians in 1850 formed .16 of 1 per cent., but have increased steadily, and in recent years quite rapidly, forming in 1900 4.67 per cent.; and the Chinese, whose numbers were absolutely trifling in 1850, increased up to 1880, when they formed 1.56 per cent., and since then, owing to the Exclusion Act, they have diminished, thus demonstrating its efficiency.

Thus the Russians, Huns, Poles, and Italians, collectively, which fifty years ago were present in this country only in trifling numbers, have increased until now they form 13.86 per cent., or about one in seven of the entire foreign element; while the British, Irish, and Germans, which half a century ago formed not less than 86 per cent. of the foreign-born population, now constitute only a trifle over half of it.

NOTES ON GEOGRAPHICAL EDUCATION.

BY

RICHARD E. DODGE.

Physical Geography as a College Entrance Subject.—The increased importance of physical geography as an entrance subject for colleges is shown by the recent action of the College Entrance Examination Board of the Middle States and Maryland in adding this subject, among others, to the list of subjects in which examinations were given by the Board last year.

The requirement in physical geography, as presented by the Board, is conformable to the other science requirements in being based on the Report of College Entrance Requirements made to the National Educational Association in 1899. The requirement demands one year of school laboratory and text study of physical geography from a modern point of view, and "includes material for the most part common to the leading text-books, though it should be recognized that no adequate laboratory manual is at present available."

The field of physical geography in secondary schools is recognized as including the earth as a globe, the ocean, the atmosphere, and the land. In the detailed requirement published by the Board the several large topics under each division are outlined, with the recommendation that the time allowance be proportionately increased in the order named above. A study of the requirements as outlined by the Board will show that certain topics generally included in a secondary course in physical geography are omitted. Such, for instance, is the topic of light, which belongs to physics and not to physical geography, though it is included in the topics recommended for such a course in the 1900 syllabus of the Regents of the University of the State of New York. It is further recommended by the Board that each topic be treated so far as to show its causal relation to other topics, and that so far as possible the effects of earth features on life conditions be emphasized. The candidate's preparation should include:

a. The study of one of the leading secondary text-books in physical geography, that the pupil may gain a knowledge of the essential principles and of well-selected facts illustrating those principles.

b. Individual laboratory work, comprising at least forty exercises. From one-third to one-half of the candidate's class-room work should be devoted to laboratory exercises. In the autumn and spring, field trips should take the place of laboratory exercises.

Such a definite and ordered requirement as is presented by the Board ought to make the geography work in secondary schools more scientific in character and more logical in method, through the emphasis of the causal side of physical geography, so that so far as can be causes may precede effects in presentation.

The report includes also a series of suggested exercises, from which the forty exercises presented by the pupil may well be selected. After each problem suggested is given its value as a proportionate part of forty, that will be assigned to it. These exercises are to be recorded in a note-book, and the note-book must be presented at the examination. Furthermore, the note-book must be the *original* note-book, and not a copy. "This book should contain an index of subjects, and must bear the endorsement of the teacher certifying that the notes are a true record of the pupil's work."

It is believed that such a recognition of the value of physical geography as a college entrance subject will have a beneficial effect on the subject as taught in the colleges and universities and the secondary schools. Students will be able to come to their college work with some training in the elements of the subject, and the secondary schools having a definite plan to follow, which will be acceptable to the leading colleges, will have an incentive to improve the character of their geography work, so as to make the subject more disciplinary and less encyclopedic in character. Through uniformity of requirement the schools will be able to fit pupils for any college, and thus save a certain scattering of energy that now prevails in secondary schools.

If now we can have a laboratory manual adaptable to secondary work in physical geography, and if the same course that is acceptable for college entrance be also accepted by the Regents of the University of the State of New York, the character of secondary geography work in the schools of New York and vicinity ought to be vastly improved in the near future.

School Journals of Geography of America.—Five years ago, in obedience to the suggestion of several educators who were in touch with the school conditions of the country, the *Journal of*

School Geography was started, with the purpose in mind of aiding the teacher of geography in elementary schools. Two years later the scope of the *Journal* was enlarged to include secondary work as well. During the five years the *Journal* has presented many strong articles from geographers and teachers of geography that have been cordially endorsed and widely approved in all parts of the world. The success of the *Journal* has been greater than was anticipated, and has shown that there is a rapidly-increasing body of teachers who desire the newest and best in school geography.

Two years ago a second school journal devoted to geographical education was started by Professor Edward M. Lehnerts, of the State Normal School, Winona, Minn., under the title of the *Bulletin of the American Bureau of Geography.* This journal has been well illustrated and attractive in character, and has proved a great success in every way. There is, however, no reason for rivalry in so limited a field as geography teaching, but rather every reason for co-operation and the most efficient expenditure of energy.

For these reasons the two journals noted above will cease to exist after January 1, 1902, and will be replaced by a new journal called *The Journal of Geography*, *Devoted to the Advancement of Geographical Education.* The new *Journal* will be under the combined editorship of the editors of its predecessors, and of Dr. J. Paul Goode, of the University of Pennsylvania. The *Journal* will be issued ten times a year, and will contain 480 pages to the volume. The board of associate editors will contain the leading workers in geography in the country, and will include a representative from nearly every branch of special geography. It is hoped that the new paper, succeeding to such well-founded prestige, may be vastly superior in every way to its predecessors, and the possibility of such a paper shows, perhaps more conclusively than other things, the improvement in all phases of geographical education since the appearance of the memorable Report of the Committee of Ten, nearly a decade ago.

The Secondary School Course of Study in Physical Geography in New York State.—The New York State Science Teachers' Association has in its five years of existence done much in presenting the need of improved work in physical geography in the secondary schools of New York State. At the 1900 annual meeting, a Committee of Seven was appointed to present a course of study to the Association this year, with recommendations for laboratory work. As the Committee was not completed until late

in the past summer, it will present this year only the proposed course of study. It is planned by the Committee to have the course of study follow the suggestions of the Report on College Entrance Requirements of the National Educational Association, and at the same time fulfil the needs of the requirements of the College Entrance Examination Board of the Middle States and Maryland. The report, when completed, will probably be printed by the University of the State of New York in the report of the 1901 meeting of the State Science Teachers' Association. The Committee of Seven consists of Principal George H. Walden, of Grammar School No. 10, Rochester, N. Y.; W. W. Clendennin, Wadleigh High School, New York City; C. Stuart Gager, of the New York State Normal College, Albany, N. Y.; Frank Carney, of the High School, Ithaca, N. Y.; P. F. Piper, of the High School, Buffalo, N. Y., and Richard E. Dodge (Chairman), of the Teachers College, Columbia University.

Geography at the New York State Science Teachers' Association Meeting, 1901.—The Earth Science Section of the New York State Science Teachers' Association will devote two half-day sessions to the problems of geography at the approaching meeting. The first session will be devoted to geography work in normal schools, the discussion being led by Professor C. Stuart Gager, of the New York State Normal College, Albany; Professor A. W. Farnham, of the Oswego Normal School; Principal C. T. MacFarlane, of the Brockport Normal School, and Professor Will S. Monroe, of the Normal School, Westfield, Mass. The second session will be devoted to a discussion of the Report of the Committee of Seven, led by C. F. Wheelock, Head Inspector of the Regents of the University of the State of New York, Miss Belle Meserve, of the Utica Free Academy, and Professor A. P. Brigham, of Colgate University.

An Important Report of Elementary School Geography.—The New England Association of School Superintendents in 1900 appointed a committee to report on the subject of school geography in 1901. The Committee consisted of Superintendent Horace S. Tarbell, of Providence, R. I., author of a well-known series of geographies, Superintendent Louis P. Nash, of Holyoke, Mass., and Principal F. F. Murdock, of the State Normal School, North Adams, who has contributed largely to the literature of geography teaching, and especially in a little book known as a Teacher's Outline of Elementary Geography.

The Committee submitted a printed report of 66 octavo pages at the 1901 meeting of the Association in November, which report deserves to be read, analyzed, and digested by every one interested in the betterment of school geography.

The report opens with an attempt to answer the following questions from the school standpoint:

1. What is commonly understood by the term "geography"?
2. What is the value of geography?
3. What are its aims?
4. What is the distinction between the *Old* geography and the *New?*
5. Is geography a science?
6. What are its scope and limitations?

The question as to what is geography is presented by reviewing the definitions of geography as given in the leading dictionaries, in the reports of the Committees of Ten, of Fifteen, and of Twelve of the National Educational Association, by showing the scope of subjects included in the *Scottish Geographical Magazine* for 1900, and by giving the contents of Professor Wagner's *Lehrbuch der Geographie.* Strangely enough, the Committee has overlooked Dr. H. R. Mill's classical shorthand definition of geography as "the study of the earth in its relation to man" and his longer definition, included in his International Geography, to the effect that "Geography is the exact and organized knowledge of the distribution of phenomena on the surface of the earth, culminating with the interaction of man with his terrestrial environment."

As regards the value of geography, the Committee, after quoting from Dr. Harris, announces that "as a source of information, valuable in itself and not merely as an instrument, it (geography) has no equal among its associate subjects."

The Committee presents for aims to be more or less attained through geographical study: 1.—Training in seeing the facts of geography about one; 2, making the learning from books and the printed page a power and a habit; 3, "to establish the habit of considering facts and making inferences thereon: the reasoning involved in the right study of geography is more closely like that of mature life than that in any other school exercise;" 4, the fourth purpose is "to gain such knowledge about the earth and its inhabitants as shall make us know the world we live in, both as to the land on which are spread out the nations and the people, with their varied means of providing for continual, essential and universal wants."

In comparing the Old geography and the New, the Committee emphasizes especially the point of view now held in reference to geography because of the doctrine of evolution, and shows that many so-called "new" geographies are new only in date and not in spirit. In contrasting the mental effects of the old and new points of view in reference to the subject, the Committee says, "Instead of limiting explanations and reasons to the single chapter on climate, as was the case with the geographies of the older type, the geographies having modern thought as their basis carry throughout all their chapters the fundamental idea of a succession of effects from evident causes, constantly appealing to this thought and constantly illustrating it, teaching that a reason for a present fact can be found by reference to antecedent facts readily inferred and to forces readily comprehended."

To show that geography is a science the Committee reviews the three stages in the development of a science:

> In the first no boundaries between them are seen, and all knowledge pertinent to their common foundation is gathered and discussed;
>
> In the second, the boundaries between them are upreared, and the fields between these boundaries are separately cultivated;
>
> In the third stage, a wide familiarity with several of these separated fields of study enables the advanced student to perceive the underlying strata of principles, to make broad generalizations and to see the several sciences in the unity of their fundamental relationships.
>
> In a sense the knowledge of geography may be considered as existing in all three stages according to the maturity, ability, and scholarship of those to whom its varied subject-matter appeals.
>
> To the children in our elementary schools it is in an indefinite form knowledge about the earth's surface, the treasures within and the life thereon.
>
> To those who have studied the subject somewhat, and to specialists in other fields it appears in the second stage. These students rear high walls about it.
>
> To those who have widely studied the science, the natural lines of division between its several branches appear, and also the fundamental unity that makes its several divisions one.

In furtherance of the same point the Committee shows that geography is a many-sided science, that closely interrelates with many other sciences. Because of these many interrelations it is necessary to choose the facts and geographical laws that are essential and yet adapted to children in elementary grades. The pages on the scope and limitations of geography are devoted to showing that it is hard to keep non-geographical matters out of a subject so long considered as a catch-all as geography has been. Particular emphasis is laid upon the fact that as a rule the technical processes of industries are not geographical. "Geography proper

stops with the raw material and transportation." An excellent caution is inserted to the effect that the new geography may be as easily overloaded with details as was the old-fashioned, so-called "sailor geography," with its "burden of unimportant rivers and capes and petty towns."

The relations of geography and other subjects are suggestively shown by bringing the relations to geometry, drawing, and arithmetic through the necessary study of direction, distance, and form; to literature and art, through the proper introduction of description or picture; to history, in the emphasis of the effects of environment on the ongoing of man; to nature study, through observation of life and its surroundings.

The report then considers the attitude of a child's mind at different stages and hence the method of teaching that must be followed if the work would be effective:

> The appearance, relative position, activities, and simple uses of geographical objects, the obvious causes and effects, the ready comparisons and generalizations, are the products of observation, imagination, and simple reasoning, and are the content of Elementary Geography.
>
> The less obvious activities and relations, the deeper causes and effects, the classes, principles, and laws of geographical phenomena are chiefly products of comparison, generalization and reasoning, and are the content of Scientific Geography.
>
> Elementary Geography is the portion for primary and grammar schools. Scientific Geography is the high school and college portion.

Based on these principles a general course of study is worked out for the whole elementary school, with the work divided according to grades, and with special emphasis of the methods to be employed and the pitfalls to be avoided. The Committee recommend that the first four years be devoted to a preliminary study of geographical objects and particularly of those elements that enter into a child's life. Detailed suggestions are given. The fifth and sixth year are to be devoted to the world as a whole, the sixth and seventh year to the continents, and the eighth year to the leading nations and the State, with a comparative study of the world in the ninth year.

It would seem that the Committee recommends a course that is unnecessarily slow, for there seems to be no reason why the world as a whole should be postponed so late or considered so long. Again, it would seem rational and necessary to have the study of one's own country more fully done in the earlier years. It should be remembered, however, that no course of study can fit all schools and all areas. The Committee has done well, therefore, in making its suggestions elastic, though definite.

The report is especially strong in showing what should not be done in geography and the geographical reasons therefor. No single publication along this line of such practical value to the non-geographically trained teacher has come to our attention.

RECENT WORK OF THE GEOGRAPHICAL ASSOCIATION (BRITAIN).— The Geographical Association of Britain, after eight years of unremitting and promising labor, has recently taken a great step in advance in inaugurating a new magazine for British teachers, called *The Geographical Teacher.*

For several years the Geographical Association has taken advantage of the possibilities furnished by the *Journal of School Geography*, and has at the same time actively exploited the necessity of a teachers' journal of geography that should be distinctly adapted to the progress of British teachers, and thus more valuable than any American journal could be.

The increased interest in geography teaching largely due to the Association, and the faith in the future evidenced by certain members of the Association, have resulted in the new journal noted above. *The Geographical Teacher* is under the editorship of Dr. A. W. Andrews and Dr. A. J. Herbertson, and is published by G. Philip & Son, at one shilling a number. The *Journal* will appear in October, February, and June. If the standard set in the first number is maintained, the new journal will be of interest and help to teachers of America as well as Britain.

The scope will be broad, and yet the papers will be practical and helpful in tone while they are scientific in character.

> It will contain articles on methods of teaching in the class-room and in the open air, on the combination of geography with other subjects in the school course, *e. g.*, geography and history, geography and classics, on syllabuses, on ordnance maps, on typical religions of the globe, especially in the British Dominions and India, on the great cities of the world, and a special series of articles on the Colonies, contributed by Colonial writers. It will criticise existing examination programmes and current examination papers, and review recent geographical literature, maps and appliances from the teacher's point of view.

The active teachers and the leading geographers of Britain have guaranteed their co-operation, and the editors announce a very attractive series of papers ready for publication. The first number is attractive in appearance as to form, paper, and typography, and several of the papers are of very general interest, and should be broadly read in this country.

The Geographical Teacher is sure to be of great value in the field to which it is addressed, and must succeed. It is especially

welcome as a sign of the times in Britain that geography is being recognized by schools as worthy of a place on a school programme, not only as a culture subject, but for its value in giving mental discipline.

With the new journal, and the other opportunities furnished by the Association in the way of loaning of slides, in the exchange of photographs, in the furnishing of a clearing house of information for teachers, and in bringing about the publication of such helpful books as Dr. Mill's *Hints to Teachers and Students on the Choice of Geographical Books for Reference and Reading*, the Geographical Association has proved its importance and its power. May its good work increase and may success continue to attend it!

MAP NOTICES.

BY

HENRY GANNETT.

CARTE LITHOLOGIQUE SOUS-MARINE DES CÔTES DE FRANCE, PAR M. THOULET, PARIS.—This map, of which nine sheets have been issued, shows by contours the depth of water off the French coast, and by colours and conventional signs the character of the sea bottom, that is, of the rocks, gravel, etc., or whether covered by vegetation.

SINCE THE LAST ISSUE of the Bulletin, the United States Geological Survey has published 17 sheets of its atlas of the United States. In Maryland are two maps, Ocean City and Belair. The former represents part of the coast, including a little of Delaware, showing the continuous sand-bar, back of which are open bays, succeeded by marshes out of which the land rises gradually. The latter lies inland just touching the Susquehanna river in the south-east corner, and represents a rolling country in which the streams are slightly incised. Both of these sheets are on a scale of 1:62,-500, the first having a contour interval of 10 feet, the second of 20 feet.

In Illinois is one sheet, Rock Island, upon a scale of 1:125,000, with a contour interval of 20 feet. It represents a country of rolling prairies, with the Wapsipinicon river meandering in a broad, flooded plain.

In Wisconsin are three sheets on a scale of 1:62,500, with a contour interval of 20 feet. Poynette is in a country of glacial deposits of irregular character, with marshy streams and lakes. Denzer and The Zells are mainly in the driftless regions, in the southwestern part of the State, and show a region of low deceptive plateaux and prairie buttes.

In Missouri is one sheet, De Soto, in the eastern part of the the State. This is on a scale of 1:125,000, with a contour interval of 50 feet. It represents a bench country which has been graded and subsequently elevated, as is shown by the incised windings of the streams.

In Arkansas are three sheets, all on a scale of 1:125,000, with contour intervals of 50 feet. Gurdon is in a low and level country

bordering the Ozark Hills on the southeast, while Eureka Springs and Winslow are in the Ozark plateau in the northwestern part of the State. These represent the characteristic features of this plateau, which is greatly dissected, and the larger streams deeply incised.

In Indian Territory are two sheets on a scale of 1:125,000, and a contour interval of 50 feet. Ardmore, in the Chickasaw Nation, contains in its northern part the Arbuckle mountains, which have the form of a somewhat dissected plateau, rising 500 feet above the surrounding country. Nuyaka is in the Creek Nation, and represents a country with very little relief.

At the junction of South Dakota, Nebraska, and Iowa is the Elk Point sheet, showing the Missouri sweeping in broad curves through a bottom land ten miles in width, in which it is joined by the Vermilion and Big Sioux rivers. From this bottom land the bluffs of the high prairie rise 200 to 300 feet. This sheet is especially interesting to the physiographer as a study in river movements.

In Montana is one sheet, on a scale of about 2 inches to a mile, with a contour interval of 50 feet, representing a mining region about Marysville.

In California are three sheets. Redding shows the upper end of the great Sacramento Valley, with the foot-hills of the Sierra Nevada and long spurs of lava running from them down into the valley, separating tributaries of the Sacramento. San Jacinto is in southern California, and shows the San Jacinto mountain group with San Gorgonio Pass and a bit of the desert east of it. It contains several good illustrations of alluvial cones. Both these sheets upon a scale of 1:125,000, with a contour interval of 50 feet. Redlands sheet, on a scale of 1:62,500, shows a part of the San Bernardino range in southern California and a part of the valley of the Santa Ana south of that range.

The General Land Office has published a new edition of its map of the State of California. This is in effect a new map, and a great improvement over former issues. The scale is twelve miles to an inch, in this respect being uniform with the other State maps of this series.

Lakes, rivers, etc., are printed in blue, and the relief is expressed by brown crayon shading.

The Argentina-Chile Boundary.—These two republics, the most powerful and progressive of South America, are at logger-

heads over the location of their common boundary. Instead of going to war over it, however, they have very sensibly referred the settlement of the dispute to Great Britain as an arbiter. The case of Argentina has been printed in four volumes and a portfolio of maps.

The difficulties between these countries have originated simply in ignorance of the principles of geography. It appears that in all their treaties concerning limits the common boundary has been defined as the "summit of the Andes," to which, unfortunately, is added as a synonym the "water parting." It is well known to geographers that a mountain range may or may not be a water parting, a divide; but treaty-makers have not yet learned that mountain ranges and divides are not synonymous terms.

Over most of the course of this boundary the crest of the Andes and the divide between Atlantic and Pacific drainage coincide, and there is no difference of opinion concerning the location of the boundary; but in the southern part, where the west slope receives a heavy precipitation, the rivers have extended their heads across the range, have captured many considerable streams on the east of the range, and now head far out on the Pampas. Here the Chileans claim that the water divide should be followed, while the Argentines hold to the summit of the Andes, and a large territory is, in the aggregate, in dispute. The decision of the arbiter in this matter will be of interest.

Another area, near the northern end of the line, is in dispute, from a different cause. Here the range is in two parts, separated by a territory scores of miles in breadth. This tract, which has an average elevation of perhaps 10,000 feet above the sea, has no outlet to either ocean, and the question to be determined is, Which of the two bordering ranges is the Andes?

Of the maps accompanying the case, which number sixteen, arranged in a portfolio, three require special mention.

Number 1 represents a large area in the northwest of Argentina, showing the region which has no drainage to either ocean, and is bordered by high mountains upon the east and west. This is upon a scale of 1:1,000,000, and the relief is expressed by crayon shading.

Number 12 is an orographic map of the Andes region south of latitude 39. The scale is 1:1,000,000, and relief is expressed by colors at intervals of 500 metres.

Number 14 is a general map of South America, south of latitude

39. It is on a scale of 1 : 1,000,000, and relief is expressed by hachures.

The other maps in this series represent details of the region shown in general in Numbers 12 and 14. These maps range in scale from 1 : 100,000 up to 1 : 500,000. Upon the larger scales the relief is expressed by contours, and upon the smaller scales by crayon shading.

Upon all these maps the fiord character of the Pacific coast is beautifully drawn out, as well as the glacial forms in the mountains. Physiographers will find much material for study in them.

Mappa Geographico do Estado do Amazonas, organizado por Ermanno Stradelli de accordo com suas notas e explorações e baseado nos melhores Mappas—1901. Escala 1:2,222,000 (about 35 miles to an inch). Streams are in blue, and relief is expressed by brown hachures. The map is based in part on original work, and in part is compiled from a variety of sources.

Amazonas, the northwest State of Brazil, has an area of 732,500 square miles (being far the largest of the States), and a population of only 148,000, or one inhabitant to 5 square miles, the only inhabited portions being the river banks.

The map represents the main streams of this area, most of them in all the detail that the scale will permit. The relief is, however, very feebly expressed.

NOTES ON AMERICAN FORESTS AND FORESTRY.

BY

ALBERT PERRY BRIGHAM.

In his recent message to Congress, President Roosevelt has given authoritative expression to the public interest in our forests and to the demand for their preservation. He urges an increase of the forest reservations and the management of them upon business principles. He shows his familiarity with practical conditions in asserting that forestry contemplates the perpetuation of the forests by use, and not by a withdrawal of forest resources. It appears that responsibility in this field is much divided. Protection of the reserves lies with the General Land Office. The United States Geological Survey is charged with the description of timber, while the Bureau of Forestry provides plans for forest management. The President advises that all of these duties should belong to the Bureau of Forestry of the Department of Agriculture. Commenting on the relation of forests to water supply and irrigation, it is then suggested that "forest and water problems are perhaps the most vital internal questions of the United States." Particularly should the reserves be protected from over-grazing, as by sheep, which drives away much wild game and impairs the capacity of the surface for water storage. Our highest sylvan ideals are expressed in the President's closing words:

> The forest reserves should be set apart forever for the use and benefit of our people as a whole, and not sacrificed to the shortsighted greed of a few.

Schools of Forestry.—In 1898, by an act of the Legislature, the New York State College of Forestry was established and placed under the supervision of Cornell University. This was the first school of this kind in America. Professor B. E. Fernow, LL.D., is Director of the College, which has three professors of forestry and several special lecturers. In addition, nearly forty members of the Faculty of the University give courses which are supplementary to forestry. Twenty-five regular students are reported, with twenty-nine from other departments taking certain courses. The work in Forestry proper occupies two years, but a four-year course, beginning with basal subjects, leads to the degree of Bachelor of the Science of Forestry. There is also a short course for

farmers, lumbermen, and other interested persons. Seminary work is done in German, forestry, literature, and lecture courses, and excursions are devoted to fish-culture and game preservation.

The State has provided the College with 30,000 acres of forest ground at Acton, Franklin County, in the Adirondack region. Here the Junior and Senior classes spend the entire spring term in practical work. This reservation, after thirty years, is to be deeded to the State, and held thereafter as a part of the forest preserve.

Some important principles of practical forest management are brought out by Director Fernow in his annual reports, which are devoted quite largely to the progress of work in the Adirondacks. The general policy contemplates some curtailment of present revenue—by leaving trees that might be cut; by careful logging, so as to save standing trees; by clearing brush and replanting certain areas. The white pine and the spruce are the most desirable timber trees; but the former has been almost eradicated, and is difficult to replace because intolerant of shade. The spruce, therefore, is to be conserved especially, and the main cutting is done upon the mature hardwoods. Spruce is tolerant of shade, and is to be developed by saving the young trees, and sufficient of the older trees, for seed.

The Director emphasizes the fallacy of the idea that forestry consists in preventing the cutting of trees. Wise harvesting and conservation are the true aims. The College forest, therefore, should afford an example of practical forest management, and be made, so far as possible, self-supporting. This is no easy task when it is remembered that part of this tract had previously been culled by the lumberman. The school, therefore, is not a heavily-endowed institution which has been given a virgin forest to manage on perfectly ideal principles. It takes a culled tract and, by thinning and planting, seeks to win steady returns and secure at the same time the development and permanence of the forest. This, as it seems to the writer of these notes, should be a sufficient answer to certain hasty reports of excessive cutting in the College forest.

One difference between this management and ordinary lumbering appears in the fact that all the top wood is worked up, and, to some extent, even the brush wood is utilized.

In 1900 the Yale Forest School, or Department of Forestry in Yale University, was founded through the munificence of Mr. James W. Pinchot and members of his family. Henry Solon Graves, M.A., is the Director. The Faculty includes professors of fores-

try, special lecturers, and various members of the teaching staff of Yale University. Regular courses now include thirty-one students, representing seventeen colleges and universities. There is also a summer school at Milford, Pa., enrolling, by the last report, twenty-seven students. Field study is provided in the Yale Botanical Garden, in certain forests near New Haven, on lands made available in the Adirondacks and White Mountains, and on the forest estates of Mr. Pinchot, at Milford, Pa. The course covers two years, and those who come to it with the Bachelor's degree from a college of high standing, or have gained equivalent training, may receive the degree of Master of Forestry. The summer course is designed for owners of woodland, forest rangers, teachers, and any others who wish information in this field.

The Biltmore Forest School is conducted by C. A. Schenck, Ph.D., at Biltmore, N. C., upon the George W. Vanderbilt estate. The school does not confer degrees, but gives a course of instruction covering twelve months in theoretical and practical forestry. The lectures cover the usual subjects, and are given during two hours of the morning. In the afternoon the young men are in the saddle, accompanying the director to any point where he is supervising work on the forest estate, which comprises 110,000 acres. Summer lectures are given in camp in the mountains. We are told that

> the life at Biltmore puts the student to the test, bringing out his capabilities and answering for him the question whether or not forestry is that profession to which he is willing to devote his life.

The circular of the School defines American forestry as "the art of developing and exploiting forestal investments." Thus Dr. Schenck appears to be quite in harmony with the practical ideals set forth by the directors of the Cornell and Yale schools. Accordingly, on the Vanderbilt lands, some areas are devoted to tree growth, the higher mountain areas are given up to grazing, and the cuttings are guided by the markets and the proximity of the timber to Asheville.

Private Forestry in the Adirondacks.—Director Graves of the Yale Schools is the author of Bulletin 26, Division of Forestry, dealing with Practical Forestry in the Adirondacks. Working plans were prepared for two large tracts belonging to private owners. One is Nehasan Park, the property of Dr. W. Seward Webb, and the other is the Whitney Preserve, of 68,000 acres, about Little Tupper Lake, owned by Mr. W. C. Whitney. In the latter

we have the first case of systematic forestry by a lumber company in the Adirondacks. Work in the Adirondacks is of special interest because the State has holdings of 1,100,000 acres in that region. No lumbering is allowed on these State lands, though it is stated that conservative cutting will doubtless in time be undertaken. The State can afford to leave more capital invested in standing timber than is possible with private owners. Thus, for financial reasons, such holders must often depart from the procedures of ideal forestry. We must set aside some rules used in Europe, because we cannot afford to observe them. As a sample of these concrete difficulties, the individual owner cannot bear the continuous burden of taxation, the fact being that taxes are reduced about one-half after lumbering. "Every plan of forest management in this country," says Mr. Graves, "must be in a measure a compromise between the owner of the forest and the forester."

Measures shown to be unprofitable on the two preserves described are thus enumerated—maintenance of a sustained annual yield; removal of dead and unsound trees; thinnings and improvement cuttings; permanent roads; planting, and fire lines. All these things are desirable, but cannot be done without loss. For example, a sustained annual yield is the ideal result of forest care; but such cutting is too expensive, and resort must be had to periodic lumbering.

It may be asked, what *is* practicable? In reply, it is to be said that the losses and destruction due to careless lumbering may be prevented. Thus the cutting of high stumps causes large losses, in extensive tracts. Much top wood is left to decay. This may, in part, as on the Cornell Reservation, be worked up into wood alcohol or other products. Valuable young trees, as spruce and pine, should not be used for skidways and roads. Careless crushing of small trees in felling and hauling can be avoided. A proper diameter limit is to be fixed for cutting; trees are to be left for seed, and fires may be held in check by due precaution, even though fire lines are impracticable.

Our National Parks.—Under this title Mr. John Muir has brought together several papers originally published in the *Atlantic Monthly*. It is not a book of forestry, but the forest is the most frequently recurring theme in it, and is described with all of the author's enthusiasm and poetic appreciation. His avowed aim is to promote the love and preservation of the wild forests of America. An introductory general chapter on our Parks and Forest Reserva-

tions is followed by accounts of the Yellowstone Park, and of the Yosemite in particular, whose forests, gardens, animals, and streams fall, one after another, under Mr. Muir's keen eye.

He follows with the sequoia, a tree which occupies a tract 260 miles long, but is most abundant within a range of 70 miles. Something is known by all, of these great trees; but one can never read without wonder of forests in which mature specimens in good situation have an average diameter of 20 feet and an average height of 275 feet, with larger examples by no means rare, and one that is known to be at least 4,000 years old. Fifteen hundred years are needed for the maturing of the tree, and when grown it is almost indestructible, though it may be maimed by lightning and by fire.

The popular impression that the species is near extinction is scarcely true. While greatly restricted as compared with its distribution in some geological periods, it still has vitality in its Sierran home, and there is evidence of its recent extension. All that is needed to save these forests is to restrain the hand of man and let nature have her way.

The closing chapter reviews American forests broadly, and utters an ardent plea for their preservation. The volume is from the press of Houghton, Mifflin & Co , and is illustrated.

Forests of Alaska.—In the reports of the Harriman Expedition (noticed on another page of this Bulletin), Dr. B. E. Fernow has given a short sketch of Alaskan forests. They are a northern extension of the woodlands of the Pacific border; and, indeed, the only true forest is on the mainland and islands of the shore belt. The Yukon basin, or interior, is mainly open country, with islands of stunted forest. Spruce, birch, aspen, and poplar are among the trees of these inland forests, which are quite unlike those of the coast and more resemble those of the Atlantic region of the northeast. The poor development is attributed to the frozen subsoil, and the extremes of temperature, from above 100° in summer to −60° or below in winter. Important as these woods will be for local use, carelessness has already led to some destructive fires.

The coast forest deteriorates in going north from Washington and British Columbia. It ends about Cook Inlet and on Kadiak Island, but with evidence of recent migrations in that region. The Alaskan peninsula and the islands to the west do not seem to be unfavourable for forest growth. But during the dry season, when alone the cones release their seeds, the winds are not in the right

direction to populate those regions. The Alaskan forest has no Douglas spruce, almost no pines, and no great firs. It consists, mainly, of Sitka spruce and coast hemlock; the latter predominating. The timber-line near the shore varies from 1,800 to 2,400 feet, but is higher in some interior situations. Spruces six feet in diameter and 125 feet in height were measured about Sitka, but the trunks are knotty and poor. Some deciduous trees occur on river bottoms and along shores, including cottonwoods, willows, and alders. The "astonishing indifference" of the trees to glaciers close at hand is observed, and woody vegetation is reported as growing on the morainic covering of some ice streams—a fact of which Russell has described the finest illustrations, from the border of the Malaspina glacier.

The reserves of timber in Alaska are not, as some have reported, of large value, save for local use, both because of poor quality and difficult transportation. The Yukon and White Pass Railroad is built with imported ties, although it crosses a forested region.

GEOGRAPHICAL RECORD.

ASIA.

Photographs of Lhasa.—Admittance to Lhasa, the sacred city of the Buddhists, has so long been denied to white men or other foreigners not of the Buddhist faith that the recent publication of photographs of the city and of Potala hill, surmounted by the palace of the Grand Lama, the head of the Buddhist hierarchy, is in the nature of a surprise. *La Géographie*, in its October number, prints a photograph of Potala, on the outskirts of Lhasa, one of a number of pictures taken last summer by a Russian subject, a Kalmuck chief named Ovché Norzounof. It is a view of the south side of the hill, which rises abruptly from the plain to a height of about 300 feet, and is surmounted by the imposing palace of the Grand Lama, 180 feet high, with its surrounding fortifications, temples, and monasteries. The picture, though very interesting, shows little detail, and was probably taken at a distance of a mile or more. *The Geographical Journal*, in its December number, publishes two photographs taken by a member of the Nepal Embassy to Pekin. The date of these pictures is not given, but they were probably taken before those of the Kalmuck chief. One is a general view of the city; the other shows Potala taken at the side of the south front of the hill, and so near it that much detail of the palace and its approaches is clearly shown.

These photographs are specially interesting as those of a city which has been forbidden to Christians since the expulsion of the Jesuit fathers in 1760. Only three Europeans, since that event, have succeeded in visiting Lhasa. An Englishman named Manning entered the capital in 1811 disguised as a Hindu doctor. The French missionaries, Huc and Gabet, disguised as Buddhist monks, spent several months in Lhasa in 1846, their long residence in China and their acquaintance both with the Chinese and Tibetan languages enabling them to lull suspicion. Since that time only non-European travellers have been able to reach the city, though many explorers have made the attempt.

Native Asiatic travellers, however, have been there and returned with records sufficient to give a fairly clear idea of the city and its environment. Conspicuous among them have been Indian pundits trained by the Government for geographic work, one of whom, Naïn Singh, made two journeys to Lhasa in 1866 and 1873, during

which he determined its astronomical position and its height above the sea. Another, the explorer A-K, or Krishna, in 1879–80 made a chart of the city on a scale of an inch to the mile, which was published in 1885 in *Petermanns Mitteilungen* and is reprinted with the photographs in the above-named magazines. Another Indian explorer, Chandra Das, who visited Lhasa in 1881–82, supplied the most comprehensive account of the city and its people written by any of the Indian explorers. Then came the Russian Kalmucks, Buddhists themselves, who took great interest in everything concerning the sacred city. One of them, Baza-Bakchi, made a pilgrimage from Astrakhan to Lhasa and published an account of his journey in a volume of 260 pages, the narrative being printed both in the Kalmuck and Russian languages. No translation of this work, which is said to contain much fresh information, has appeared in any Western language. Last summer the Kalmuck chief, one of whose photographs *La Géographie* publishes, made his second visit to the city.

Lhasa may be described as oval in form, and about five miles in circumference. The estimates as to its population vary greatly—from 10,000, not including the monks, by Baza-Bakchi, 18,000 by the Austrian traveller Kreitner, 25,000 by the pundit A-K, and 31,000, 18,000 of whom are monks, by Naïn Singh.

Distribution of Siberian Products.—The report of the Siberian Railroad for 1900 throws considerable light upon the economic condition of that country. The total grain shipments by the railroad amounted to 17,575,023 poods, wheat representing more than half of the quantity of cereals shipped. Nearly two-thirds of the grain was taken out of the country, the balance being distributed along the line of the railroad as far east as the stations on the Trans-Baikal division. Of the export grain, 3,588,000 poods were sent to the mining regions of the Urals, which find the Siberian wheatfields a nearer source of supply than those of southern Russia; 3,244,742 poods went mainly to other markets in the eastern part of Russia; 2,123,190 poods went to Baltic ports for export, mainly to Germany and Great Britain; and 1,430,660 poods went through north-east Russia by river and canal to Archangel for local demand and, to a small extent, for exportation to north-west Europe. This information, of course, does not apply to the large amount of grain shipped eastward by the water routes, but it will serve as an approximate indication of the proportionate distribution of the export grain of Siberia.

Nearly all the cereals are produced in the southwestern part of the country, and are received for shipment at railroad stations along the western 325 miles of the line. Most of the wheat is grown on the rich soil of the southern province of Semipalatinsk, and is sent down the Irtysh river, a part of it being transferred to the railroad.

Only 9,705 head of cattle were sent into Russia from the pastures around Kurgan and Petropavlovsk in the southwest, most of them going to the garrisons at St. Petersburg and Krasnoye-Selo, the military station southwest of the capital. A great deal of butter from the same districts was sent either to central Russia or to the ports for export.

Tea from China is the next most important article of freight. Most of the tea is still carried in summer by the water routes, which are well developed in Siberia, considering the comparative newness of the country. The Ob and Irtysh are navigable almost to their sources, and canalized rivers and canals supply east and west conections, so that grain and other products are carried in large quantities by water to the Russian frontier. It is interesting to observe that the water routes are still more extensively employed than the railroad. In 1890, only one-fifth of the iron and steel imported, one-tenth of the refined sugar, and one-third of the manufactures were carried by rail.

The detailed statistics graphically illustrate the predominance of agriculture over other industries; the special development of agriculture in the western and southwestern districts of Ishim, Kurgan, and Semipalatinsk; the formidable competition offered by the water routes in the short summer season; and the rapidly growing importance of the cities situated both on the navigable waters and the railroad (Condensed from the *Bulletin du Comité de l'Asie Française*, Nov., 1901).

AFRICA.

TROGLODYTES OF KATANGA.—A paper from the pen of Captain Lemaire, the African explorer, printed in *La Géographie* (Nov., 1901), seems to show that the reports of extensive limestone caverns in the Katanga district of the Congo Free State, inhabited by many troglodytes, have been exaggerated. These reports appear to have been started by a book entitled *Garenganze*, written by the missionary F. S. Arnot, who said (p. 198):

"Going northwest nearly to the Kalasa mountains, I had a good view of the famous cavern mountain, which is inhabited. The

great cave has two entrances, a distance of five miles or more apart, and within is a running stream. There are also many smaller caves and dens in this mountainous country in which the natives hide themselves. The entrances to these caves look like rabbit-holes. They form such perfect retreats that Msidi could extort no tribute from these people. Near the mouths of the caves they have millet gardens. They greatly feared my inspecting the caves, and I had to promise that I would not do so or none would have come near me."

A communication to the Belgian Royal Geographic Society (May 4, 1893), describing another cave, told of "troglodytes living in long galleries dug in the almost perpendicular wall of a cliff."

Lemaire's researches included a number of these limestone caverns, only one or two of which appear to be of considerable extent, and none of them is inhabited. At the village Molobo are seventy-five huts surrounded for protection by two or three rows of poles, which also enclose the entrance to two small caves that are reached by rough ladders. It may be that these underground galleries connect with a larger one, but none is inhabited in ordinary times. The caverns of Ki-Bué, three miles from Molobo, are interesting. Ki-Bué, on the right bank of the Lu-Fira river, is perched on the top of an almost perpendicular wall, in which are the entrances to the caves that serve as a refuge in case of trouble. The path leading to the largest cavern is dangerous, as it would be easy to fall from it into the river. The roof has been discolored by smoke; a proof that it is often occupied. Upon taking refuge in this cave the natives may consider themselves safe from enemies. But nothing has been done to improve the cavern for permanent residence. In time of peace the natives occupy the huts of their village. Lemaire saw neither women nor children; they were undoubtedly hiding in the caverns. The explorer says that while he believes the natives did not reveal to him all the secrets of their caverns, he saw enough to disprove the legend of "troglodytes" living in them.

Capt. Lemaire also explored other caverns, and he reached the conclusion that none of the natives is a troglodyte, properly so called. The tribes live in the midst of their fields; but in times of war they run to earth and keep quiet till the danger is over.

The Sombwe cavern, of which Arnot wrote, is composed of a series of fissures leading to a spacious hall, very humid and entirely dark.

The most important cavern found (Ki-Amakélé) is reached by

two circular cavities twenty to thirty-five feet deep, which communicate with the cavern. The descent is made by a ladder into a passage-way leading to a large hall decorated with calcareous formations. This hall has been closed by a recent fall of rock, but before the accident occurred Mr. Delvaux, exploring it, ascertained that it was large enough to hold 200 persons. A gallery leading from this hall could not be entered, as it was filled with deadly gas. The second entrance to this cavern leads to a nearly square room about 170 feet in length and width, and eleven feet high. This gallery is well ventilated, having fissures in the ceiling which admit the air. But the cavern is not used as a place of habitation.

Railroad on the Upper Congo.—The Government of the Congo Free State has decided to build about 800 miles of railroad from Stanleyville (formerly Stanley Falls), so as to unite the Congo by steam both with the Nile and with Lake Tanganyika. Engineers have been engaged for about two years in making surveys for the projected railroad to the Nile at its outlet from Albert Nyanza. The line will extend through the forest region direct to the extreme north of Lake Albert at Mahagi. It will be about 450 miles in length.

The second line will be divided into sections connecting navigable stretches of the Congo above Stanleyville. The first section will skirt the rapids for 120 miles, as far as Ponthierville, whence communications will be continued by water for 240 miles to the cataract below Nyangwe. The rapids will be doubled by a second section to the navigable reach above Nyangwe. The third section of the road will connect the upper Congo with Lake Tanganyika. It was decided from the first that these great improvements should permanently be the property of the State.

The Telegraph in Central Africa.—Mr. Mohun, formerly the American Consul at Loanda, West Africa, was engaged by the Congo Free State in 1898 to establish a telegraph line between Lake Tanganyika and the Congo River. He has completed the work and returned to Belgium. His wire and equipment were carried by steamboat, porters, and wagons from the mouth of the Zambesi to Lake Tanganyika, where he began the erection of the line at Sungula, extending it west along the caravan route to New Kasongo, on the upper Congo. He says that New Kasongo has become one of the most important trading points in Central Africa. It is visited by thousands of natives, Arabs and a few Europeans, who come to this centre to sell and to buy. Merchants of Zanzibar send cara-

vans with foreign commodities to this place, and all the country around it for twenty days' journey is commercially tributary to the town (*Mouve. Géog.*, 1901, No. 45).

NAVIGATION ON THE NIGER.—*La Revue Française de l'Etranger et des Colonies* (1901, p. 370) says that the Lenfant Mission has arrived at Say, on the upper Niger, with freight carried up the river from the sea. This is the first time that the Niger has been used for freight carriage from the ocean far into the interior, it being supposed that the difficulty of navigation through the rapids would render such service impossible. Captain Lenfant was instructed to occupy the regions between the Niger and Lake Chad which were transferred to France by the Franco-English Convention of 1898. Navigation on the lower Niger, though in British territory, is free to all nations, and the French accordingly desired to ascertain whether they might utilize this all-water route to the far interior. Lenfant had no special difficulty in ascending the river to Badjibo in lighters with 8,000 cases of food and other supplies. He ascended the rapids above Badjibo in April and May last with sixty tons of merchandise in fifteen wooden lighters. The river being low, it was a very unfavourable time for passing the rapids, and the difficulties were formidable, progress being possible only by hauling on tow-lines fastened to rocks ahead. The enterprise, however, was successfully carried out. It is believed that the experience now gained will lessen the difficulties of further attempts to navigate these waters, and that the economic value of this route to the new French territory will be important. Captain Lenfant proposed to make a second ascent in August, at high water, when he expected that an easier passage might be made.

A SUBTERRANEAN NILE.—The depression of the Oued-Rhir, in the Algerian Sahara, directly south of the Auras Mountains, may be called a channel in a plateau of limestone and sandstone, running north and south, and bordered by escarpments about twelve miles apart at the edges of the plateau. The depression, about ninety-three miles in length, is fertilized by a subterranean Nile, turning the desert into a garden. It is the most important oasis in the Algerian Sahara, its verdant aspect being in striking contrast with the whitish waste of the plateau around it. The chief settlement in this depression is Tugurt, and around it are nearly 200,000 date-palms. Nearly all of the inhabitants are of the Ruara tribe, an industrious people, well-sinkers and date-growers. To the north are the Atlas ranges of Algeria, the effective barrier that prevents

Mediterranean rains from reaching this region. The only sources of humidity are dew and the rain and snow that fall on the wide mass of the Auras Mountains. These waters disappear in the sandy soil on the southern slope of the mountains, and this is the origin of the unfailing supply of water that underlies the depression of the Oued-Rhir. The depth at which the water is found varies with the distance below the surface of the impermeable stratum on which it flows. The natives have for ages sought to make this underground resource available; but with their rudimentary methods they were able to reach it only when the superficial strata were neither too thick nor too hard.

In 1856, Col. Desvaux began to tap this water source by boring, and the results conferred great blessings upon the whole district. Between 1857 and 1896, 777 artesian wells, 320 of which are spouting wells, became sources of life to the surrounding lands. The combination of water and sun developed the great date-raising industry of the Oued-Rhir, which is now one of the most productive parts of Algeria.

EUROPE.

INTERIOR NAVIGATION IN GERMANY.—*La Géographie* (Nov., 1891), deriving its information from the diplomatic and consular reports to the French Government, says that the Rhine has to-day the largest traffic of all European rivers. It also carries maritime navigation farthest inland. Cologne has become a seaport like Düsseldorf and Duisburg. The movement of sea vessels on the Rhine is comparatively important. One line of steamers plies from Duisburg and Düsseldorf, in the Rhine-Westphalia industrial district, to the Baltic, importing lumber and exporting coal and iron. A line of three steamers makes regular trips between Ruhrort, Düsseldorf, and Cologne on the Rhine, and London. Another line of eighteen small steamers connects lower Rhine cities with ports on the North Sea and the Baltic as far as Riga, Russia. Another line of four steamers plies between Cologne and St. Petersburg, the same company also having steamers regularly in the trade between Cologne and Palermo. Three steamers are in service between Cologne and Hamburg. The barge trade between Cologne and Baltic ports is also important, seaworthy barges of from 600 to 1000 tons being towed by powerful tugs. Ruhrort, the great coal port of the Ruhr coalfields, with a commercial movement of about 6,000,000 tons a year, is the most active port on the Rhine. No other interior port of Europe has so large a traffic. The commercial move-

ment of the other Rhine ports in 1900 was: Duisburg, with Hochfeld, 5,544,000 tons; Mannheim, 4,704,000 tons, of which 403,000 tons came from the Necker; Ludwigshafen, 1,447,000 tons; Mayence, with Gustavsburg, 1,131,000 tons; Frankfort-on-the-Maine (which may be considered a Rhine port), 1,687,000 tons; Cologne-Deutz, 1,019,000 tons; Düsseldorf, 619,000 tons; finally, Strassburg, 609,000 tons.

The Elbe comes next after the Rhine. The traffic of 1900 between Hamburg and the upper river amounted to 5,440,000 tons. On the Oder the city of Breslau is the most active port, with 1,313,000 tons local traffic and 996,700 tons transit trade. The canal between the Spree and the Oder carried 1,679,000 tons of freight. The movement on the Swine river amounted to 508,000 tons.

During the year 1899–1900 the Kaiser Wilhelm Canal was navigated by 26,279 vessels of 3,488,767 tons. This is an increase of 463 vessels and 370,927 tons over the preceding year.

Surveying the British Lakes.—Dr. H. R. Mill, in his presidential address to the geographical section of the British Association at Glasgow, announced that Sir John Murray and Mr. Laurence Pullar had decided to complete the bathymetrical survey of all the fresh-water lakes of the British Islands. Mr. Pullar has made over to trustees a sum of money sufficient to enable investigation to be commenced at once and to be carried through in a comprehensive and thorough manner. All the lakes will be sounded and mapped as a preliminary to complete limnological investigation. The nature of the deposits, the chemical composition of water and its dissolved gases, the rainfall of the drainage areas, the volume of the inflowing and outflowing streams, the fluctuations in the level of the surface, the seasonal changes of temperature, and the nature and distribution of aquatic plants and animals will all receive attention (*The Geog. Jour.*, Oct., 1901).

The German Colonial School.—This institution, established two years ago at Witzenhausen to fit young men for responsible positions in the Colonies, has thus far sent twenty-five of its pupils to East Africa, South Africa, the Cameroons, Togoland, and other tropical regions. During the last term the school had forty-six pupils. The theoretical instruction includes colonial government, commerce and communications, chemistry, geology, zoology, tropical hygiene, and tropical agriculture. The practical instruction includes work in the field, shop, and laboratory relating to

agriculture, gardening, chemistry, wood and stone working, blacksmithing and carpentry. A model farm of 425 acres is part of the school property. This school is one of the agencies that are contributing to the intelligent development of the German colonies. Others are the experimental stations maintained by the Government in East and West Africa and New Guinea; and the coffee, cotton, tobacco, and other plantations which are being opened by colonial societies in the foreign possessions.

SOUTH AMERICA.

PROGRESS ON THE TAPAJOS RIVER, BRAZIL.—The Tapajos, the third largest southern affluent of the Amazon, is still imperfectly known. Navigation is confined to the lower section. Unless railroads are built around the cataracts, the Tapajos can never become a means of communication between the Amazon and the far interior. There is a fortnightly steamboat service from Pará, and two or three trips a month are made by a steamer from Santarem, at the mouth of the river, to the first cataract, a distance of 230 miles. Commerce is developing, especially in rubber. New settlements have been founded, which as yet are indicated on only a few of the best maps, while towns still shown on the maps have disappeared. Itaituba, on the middle river, seems destined to be the largest settlement. It lies in the centre of a region that is very rich in rubber, and its commercial importance is already larger than that of Santarem. In the region to the south many settlements have sprung up in the past few years whose inhabitants devote themselves to the rubber industry.

AUSTRALIA AND NEW CALEDONIA.

SUBTERRANEAN LAKES IN AUSTRALIA.—Natives in the service of Mr. G. B. Scott have discovered subterranean lakes in the Eucla district, north of the great Australian Bight. The *Scottish Geographical Magazine* (Nov., 1901) says these lakes are sixteen miles west of those discovered by Mr. Juncker. They contain an apparently unlimited supply of good drinking water at a depth of thirty feet from the surface, and in country providing good indigenous bush feed for cattle. This fresh discovery emphasizes the possibility of revolutionary development in Central Australia, which may yet make feasible an amount of inland settlement of which we have not previously conceived in that drought-stricken area. The discovery also casts some light upon the problem of what becomes of the

Central Australian waters not lost by evaporation and of the rivers which disappear so provokingly. The solution of this problem would probably go far to settle the question of utilizing the country, whose only lack is water.

A Railroad in New Caledonia.—The first railroad in the smaller islands of the Pacific, except in Hawaii, is now building in the French colony of New Caledonia, the work beginning on August 17th last. The road will skirt the west coast, connecting Noumea, the capital, with Bourail, the most important agricultural centre of the island. The governor of the colony, M. Feillet, says that the railroad, which will be about ninety miles long, will make it much easier to develop the cobalt, nickel, and other rich mineral resources, and that Indian coolies will be imported to augment the labour needed in the mines. The Nickel Company proposes to extend the railroad further north to Koné.

POLAR REGIONS.

Some uneasiness is felt in Norway with regard to Capt. Sverdrup's party in the *Fram*, and it has been proposed to send an expedition to the East Greenland Coast in search of the missing ship.

The *Fram* was provisioned for five years—a fact which seems to have been overlooked in noting Capt. Sverdrup's failure to establish caches along the line of his route, so far as known—and there seems to be little reason to fear disaster to so staunch a vessel, commanded by the able seaman who carried her through all the perils of her first three years in the frozen seas of the North.

It is announced that a Norwegian expedition, under the command of Mr. Amundsen, one of the party on board the *Belgica*, will be sent to determine the position of the north magnetic pole.

The Russian-Swedish measurement of an arc of the meridian in Spitsbergen is still unfinished. *Petermanns Mitteilungen*, 47 Band, IX, reports that the Russian party had succeeded in determining all the points of triangulation, but that the Swedish division had been hindered by the ice and had been unable to complete its work, which must be taken up again in 1902, if, as is to be expected, the Diet makes the necessary appropriation.

MR. W. S. BRUCE writes in the *Scottish Geographical Magazine*, for November, that he has been successful in raising sufficient funds for one complete year's work in Antarctic exploration, and that the Scottish Antarctic Expedition will leave Scotland in the autumn of 1902. This delay he looks upon as a decided gain, since it allows time for thorough preparation and for special training.

One change will be made in the plan: there will be no winter station established. Mr. Bruce's opinion is that the greatest present need is a free-moving ship constantly doing work on the *Challenger-Valdivia* lines for a whole year. If the ice conditions are favourable, the ship will push as far southwards as is prudent; but in no case is it Mr. Bruce's intention to allow the ship to be caught in the ice. The expression is emphatic; but the ice has been known to take no note of intentions.

FIELD ICE NEAR CAPE HORN.—The sugar-laden bark *Nuuanu*, which left Honolulu in June and arrived at Philadelphia early in November, was caught in field ice in September while rounding Cape Horn. The ice extended as far as could be seen to the south, with fair weather and a smooth sea.

BOOK NOTICES.

The Harriman Alaska Expedition, Edited by C. Hart Merriam, 2 Vols. 383 pp., illustrated, Doubleday, Page & Co.

This is easily the most beautiful geographical work of the year, if not of many years. The text is printed on large paper, and is accompanied by 39 exquisite coloured plates, 85 photogravure plates, 240 figures in the text, and 5 maps. The subjects of the pictures in colour are landscapes, birds, mammals, and flowers. Most of the illustrations are from photographs by members of the expedition; about 5,000 were taken. There is a preface by Mr. Edward H. Harriman, patron of the expedition, and this is followed by an introduction by Dr. Merriam.

The expedition was planned as a summer cruise for family and friends in 1899. It was extended to take in a large group of scientific observers, and route and plans were fully accommodated to their needs and studies. A specially-chartered ship conveyed the party, with an outfit of naphtha launches, a library, and every convenience for work. In addition to the scientific party, a number of artists, taxidermists, photographers, and stenographers accompanied the expedition. Organization was effected into a large number of special committees, for plans, lectures, and various departments of scientific observation. Several members of the party will be named in connection with chapters contributed by them to these volumes. Among others were F. V. Coville, Curator of the National Herbarium, Professor B. K. Emerson of Amherst College, and Mr. G. K. Gilbert of the United States Geological Survey. The plans were carried out with the co-operation of the Washington Academy of Science, and a large amount of data and considerable collections were gathered, which will form the basis of a series of technical publications. These later volumes will deal with geology, paleontology, zoölogy, and botany.

The narrative of the cruise is by John Burroughs, and occupies 118 pages. The voyage began at Seattle and followed the inside route, with frequent landings, including a railway trip over the new line to White Pass. Glacier Bay was visited, then Sitka, Yakutat Bay, Cook Inlet, and Kadiak Island. Thence the course followed the Alaska peninsula to Unalaska, and turned northward through Bering Sea to Plover Bay, on the shore of Siberia. The

return was made by Port Clarence on the Alaskan side, thence following nearly the outgoing route to Seattle.

A short chapter by John Muir describes, or rather enumerates, many of the ice streams. The interesting fact appears that since the author's first visit in 1879 some of the trunk glaciers about Glacier Bay have receded beyond the points of confluence of their tributary streams, thus increasing the number of separate glaciers. Several new glaciers were found in a fine inlet, now discovered for the first time, and named, appropriately, the Harriman Fiord. This is a really significant addition to the map of Alaska.

Mr. George Bird Grinnell contributes a paper on the Natives of the Alaska Coast Region. The Alaska Indians are characterized as a hardy race, being good mountaineers and brave mariners. Their chief food is salmon, and in their canoes, hollowed from a single log, they are at home on the sea. They build substantial villages, and the totem poles and other forms of native art are quite fully illustrated. The first Eskimo were seen at Prince William Sound, and the Aleuts at Shumagin Islands.

Volume II opens with the Discovery and Exploration of Alaska, by William Healey Dall, well known as an authority on that region. He marks the first period as including visits of Cossacks, and of the Bering expeditions, down to 1799. Then the Russian-American Company was chartered and held sway until 1867, when a third period opens with the ownership of the United States. A fourth era begins in 1895 with the development of the Klondike gold-fields. The first accurate description of the coast is ascribed to Cook, who visited the region in 1778. Transfer to American jurisdiction was not at first an unmixed blessing, for conditions approaching anarchy long prevailed. The work done by the Coast Survey, the Geological Survey, and by other Government organizations is far larger than is commonly known, and a bibliography of 4,000 titles upon that region is far from complete.

A splendidly-illustrated chapter on the Birds is from the pen of Mr. Charles A. Keeler of San Francisco. The Forests are described by Dr. B. E. Fernow. A review of his paper will be found in Notes on American Forests and Forestry, on another page of this BULLETIN.

The general geography is treated by Mr. Henry Gannett. The extent of the country is enormous, though but half realized. The coast is heavily glaciated and deeply fiorded. Two young islands appear in Bering Sea—Grewinck being only 17 years old, and Bogoslof 104 years old. Both are volcanic, and a special chapter is

devoted to the latter. The mean annual temperature of the Pacific Coast belt of Alaska is 54° to 60°. It is about that of Eastport, Me., but differs in being cooler in summer and warmer in winter. Owing to prevailing dampness, it is a "chilly" climate. The rainfall at Sitka is 105 inches. In Bering Sea fog is the normal condition. The Aleutian Islands shut out the warm Pacific waters, and sailing is uncertain. The interior of Alaska has a high range of temperature, 147° being recorded; while, as would be expected, the range at Sitka is much less, 90°. At the same time the interior is dry, and has more sunshine in a month than Sitka has in a year. The population in 1900 was 63,592, having nearly doubled in the previous ten years. Mr. Gannett's adjective for the resources of Alaska is—"enormous." In placer gold $5,000,000 came from Cape Nome in the summer of 1900. Agriculture, however, is not promising in Alaska. A most appreciative word is uttered for the scenery, whose "grandeur is more valuable than the gold or the fish or the timber, for it will never be exhausted."

The chapter on the Alaska Atmosphere is by Professor William H. Brewer of Yale University, and deals chiefly with the colours of the sky. Other papers are: Bogoslof, Our Newest Volcano, by Dr. Merriam; the Salmon Industry, by Mr. Grinnell; and Fox Farming, by M. L. Washburn. Mr. Gilbert contributes a note on the Physical History of Bogoslof.

A. P. B.

Aus den Hochregionen des Kaukasus. Wanderungen, Erlebnisse, Beobachtungen von Gottfried Merzbacher. Erster Band. Mit 144 Abbildungen nach Photographien gezeichnet von E. T. Compton, Ernst Platz und M. Z. Diemer, und zwei Karten. Zweiter Band. Mit 102 Abbildungen nach Photographien gezeichnet von E. T. Compton, Ernst Platz, M. Z. Diemer und R. Reschreiter und einer Karte. Leipzig, Verlag von Duncker & Humblot. 1901.

The magnitude of this work is oppressive. The first volume contains 957, the second 963 closely-printed octavo pages, including an index of 117 pages, thoroughly well done, like the rest of the work. It is impossible to review such a book; nor is it a book to be read. It is rather an encyclopædia to be consulted as an authority.

Mr. Merzbacher devotes his first chapter to the orography and structure of the Higher Caucasus. In the centre the axis of the chain is composed of crystalline rocks, granite, gneiss, and granu-

lite; to the west, of porphyry, diabase, and gneiss, and along the axis are deposited the oldest sediments, by which it is completely covered in the eastern part of the chain.

In the Caucasus the snow-limit is lower on the southern slope than on the northern, a point of resemblance with the Himalayas. The contrary is the case with the Alps. Erroneous impressions have prevailed with many as to the poverty of the Caucasus in glaciers.* It is, in fact, not less rich in glaciers than the Alps.

The hydrography is simple. There are no such rivers as in the Alps, but on the two slopes flow two large streams parallel with the direction of the chain, and the water-shed between the two seas, to the south and to the north, is also a climatic dividing wall.

The passes of the Caucasus are all at a great elevation. Mr. Merzbacher gives a list of 68, many of them occupied by glaciers. The lowest pass is Psegaschka, 6,880 feet high, in the west; the highest is Dychni-ausch, 12,720 feet, in the central chain. The famous Dariel pass is 7,800 feet in height.

Mr. Merzbacher climbed many of the peaks, with the ardour of a professed Alpinist; but he was interested in men not less than in rocks and walls of ice, and his chapters on the mountain peoples have a special value.

The illustrations are charming and in every way worthy of a text in which nothing is wasted.

The map (in three sheets) is based upon the surveys by the General Staff of the Army of the Caucasus.

Publications of the Museu Paraense de Historia Natural e Ethnographia.

These publications just received are:

ARBORETUM AMAZONICUM, 1ª e 2ª Decadas, the Iconography of the most important Plants growing spontaneously and cultivated in the Amazonian Region, by Dr. J. Huber, Chief of the Botanic Section of the Museum. These present twenty quarto plates, beautifully printed, with brief descriptions in Portuguese and French;

ALBUM DE AVES AMAZONICAS, 1° Fasciculo, Estampas 1–12, by Dr. Emilio A. Goeldi, Director of the Museum. These twelve plates, somewhat smaller than those of the *Arboretum*, show the birds with their colouring among the trees and on the shores, as they live.

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* Among those who have committed themselves to error on this subject are named Heim, Agassiz, Salatzky, and *Réclus;* so printed, even in the index.

The native or Portuguese name is given in every case with the scientific name;

MEMORIAS DO MUSEU PARAENSE.

I.—Excavações archeologicas em 1895—1ª Parte : Artificial Funerary Caverns of Indians now extinct on the River Cunany, and their Ceramics, by Dr. Emilio A. Goeldi. The four plates accompanying the text were made in the Museum. One shows sections of the site of the excavations and of one of the caverns; the other three give coloured reproductions of pottery found in the caves.

II.—Zwischen Ocean und Guamá. A Contribution to the Knowledge of the State of Pará by Dr. K. von Kraatz-Koschlau and Dr. Jacques Huber. With a map (of the northeastern part of the State) and ten plates.

It would not be easy to improve upon these strikingly handsome publications.

M. FROIDEVAUX'S PARIS LETTER.

PARIS, November 21, 1901.

Having sketched in previous letters the history and the present organization of the Geographical Service of the Army, we have now to mention the works already accomplished and those now in progress under this active and important institution; so far, that is to say, as relates to the maps furnished to the public, and omitting entirely those known as *special*, which are executed for the particular requirements of the army.

Much the best-known work published by the Geographical Service is the map of France on the scale of 1:80,000, commonly known as the Map of the General Staff. Prescribed by royal order of August 6, 1817, to replace the Cassini map, which had become inadequate, the new map was begun April 1, 1818; the topographical work was completed in 1866 and the engraving not until 1882. The map comprises 273 sheets; it is periodically revised on the ground, and has been constantly kept up to date since 1889 by the Geographical Service.

To facilitate consultation and the handling of the map, the great sheets of 80 by 50 centimetres have been divided into quarter-sheets (40 by 25 centim.). This transformation was effected in the years 1889–1898, and he who wishes to possess a complete representation of France in this 1889 type must purchase 965 quarter-sheets, some of which are full, while others cover a part of the frontier.

It would be interesting to devote a few pages to the curious history of the map on the scale of 1:80,000, and I may be able to do this at a later day. For the present it will suffice to note that, the insufficiency of the map having been recognized by the Central Commission on Geographic Work, the Geographical Service of the Army began in 1897 an amplification on a scale of 1:50,000; a mere enlargement of the other, but none the less useful, and a provisional solution, waiting upon the decision of the Parliament in favour of a map on a large scale, the necessity of which becomes more and more marked, and the appropriation of the funds for the enterprise.

By the side of this enlarged map, work upon which proceeds only in the absence of more pressing duties, the Geographical Service possesses several reductions of the same map, each offering its own interest. One is the chorographical map of France on a scale

of 1:200,000, in 82 sheets, giving the position of administrative centres, including the communes, the hamlets, the remarkable places, the roads fit for vehicles at all times and those irregularly kept, when they are of importance to be known. Another is the map on a scale of 1:320,000, in 33 sheets, a veritable communal map of the country, which shows only the principal routes of communication and the administrative centres down to the chief places of the communes. In this the surface forms have been generalised so as to be in accord with the scale. Finally, there is the map of French railways, on a scale of 1:800,000 (in 4 sheets), which has taken the place since 1895 of the one at 1:1,250,000, become unserviceable by reason of the increasingly complicated network of lines. This map is made to keep pace with the opening of new roads.

The details relating to each one of these maps published by the Geographical Service of the Army will be found in the remarkable historical work on the *Carte de France de 1750 à 1898*, published three years ago by Col. Berthaut, head of the Cartographical Section. Nor does the Geographical Service confine itself to the study and the cartographical representation of the mother country; its activity extends to the French colonies, and, thanks to it, our territories of north-western Africa are already provided with a number of excellent topographical maps. First may be named the Topographical Map of Algeria, on a scale of 1:50,000. The first sheets appeared in 1884, and about 150 are now on sale, each measuring 64 x 40 centimetres. Next comes the Chorographical Map of Algeria, on a scale of 1:200,000, similar in design to the Map of France, on the same scale. Thirty sheets of this have been brought out since 1890. Lastly, there are six sheets of a Map of Algeria, on a scale of 1:800,000, which, based at first upon the itineraries of the expeditionary columns, was completely reconstructed in 1893, and is now established in great part upon regular surveys. It is kept up in accordance with the latest topographical work, and forms the basis of a march Map of Algeria, also on the scale of 1:800,000.

There are corresponding maps for Tunisia, the two countries belonging to the same natural region, and the Tunisian map being a natural prolongation of the Algerian.

Between 1882 and 1887 there was made, on a scale of 1:200,000, a map to answer the first requirements of the French occupation; but, with the progress of colonisation, this soon became insufficient, and in 1888, by an agreement between the French Government and that of the Bey, the Geographical Service was charged with the execution of the regular map of the Regency, on a scale of 1:40,000,

publication to be made on the scale of 1:50,000. To secure greater rapidity of execution a new agreement in 1895 limited the surveys for the 1:40,000 to the north of Tunisia, the Sahel and the environs of certain cities (Kef, Sfax, Gafsa, Gabes, and Ksar Medenin); the rest of the territory to be on the 1:80,000, and for publication on 1:100,000. The operations on the ground are now carried on simultaneously on the two scales of 1:40,000 and 1:80,000; more than 50 sheets at 1:50,000 are surveyed or finished and on sale; but the publication of the map at 1:100,000 has only just begun. In fact, the map of Tunisia, on the scale of 1:800,000 (the prolongation of the Algerian on the same scale), is the only one up to the present date; it is a reduction of the provisional map at 1:200,000 and of the regular surveys made since 1888, and it is regularly corrected by the most recent topographical operations.

Another work which does great honour to the Geographical Service of the Army is the map of Africa, on the scale of 1:2,000,000, in 63 sheets, drawn in 1875–1890 by the *Chef de bataillon* of Engineers de Lannoy de Bissy, and continued since 1891 by Capt. Rouby. Based on the information contained in geographical collections and in the reports of travel, this map is the result of comparison and co-ordination of the maps on different scales made to show the explorations, as well as of manuscript and unpublished originals, and it is constantly corrected and kept up in accordance with new discoveries.

Of many other important maps in process of execution by the Geographical Service on the uniform scale of 1:1,000,000 may be mentioned those of Asiatic Turkey (in 12 sheets), of Asia (the sheets of the Gulf of Pechili, Korea, and part of Japan), and of America (the first twelve sheets relate to a portion of the Antilles, the scene of the principal events of the Spanish-American War). We shall undoubtedly have to return at a later period to some of these productions, conceived on the same plan.

So far as relates to the doings of our travellers or precise information concerning their scientific work, the past two months are somewhat scantily furnished.

Nothing very certain is known of the explorations in progress, and most of the information received concerns expeditions already terminated. For instance, M. A. Chevalier, known for his interesting botanical explorations in the French Sudan, has communicated to the Academy of Sciences certain curious facts which seem to point to the recent immersion of the Sahara (the presence in the neighbourhood of Timbuktu of *Marginella Egouen* and *Columbella*

mercatoria, essentially marine forms still living on the coast of Senegambia). These are facts to be associated with the presence of a fossil sea-urchin at Zau Saghaïr,* and they call attention to a much-disputed question, which further discoveries will no doubt enable us to answer.

Capt. Lenfant, commanding the flotilla on the Lower Niger, has sent to the Société de Géographie precise information concerning the freshets of the river and the geology of the districts which he has visited, and M. Georges Thomann, Assistant Administrator of the Colonies, has furnished in the *Bulletin* of the Comité de l'Afrique Française an account, less clear than it might be, but really new, of the Sassandra, on the Ivory Coast. In Equatorial Africa the reconnaissances of Messrs. Bobichon and Superville have extended the domain of geography, and the latter, in his exploration of the Kotto, has shown that the conditions of this river are analogous to those of the Mbomu, and that it may be navigated without danger, even at the stage of low water. In the same region Lieut. Bos, Administrator of the circle of N'Sakkara, has executed an interesting itinerary and surveyed more than 1350 kilometres, a good part of it in unknown territory. With the *Bulletin's* information concerning the countries visited by these two travellers may be compared the excellent studies of Dr. Cureau on the Zandé plateaux. His two articles in the *Revue générale des Sciences Pures et Appliquées* are, in fact, a commentary on his fine map published in 1900 (15 Oct.) in *La Géographie*. It is also in *La Géographie* that Lieut. A. H. Dyé has begun to publish the list of geographical positions in Central Africa astronomically determined by the Marchand Mission.

Attention may be called to Capt. Lemaire's memoir on the Grottoes and the Troglodytes of the Katanga.†

Another interesting publication in the October number of *La Géographie* is the map of M. Hugues Le Roux's itinerary from Addis-Abeba to the Blue Nile by way of the Wallaga country. Menelik, King of Kings, certifies in an official document that M. Hugues Le Roux is the first European to behold the confluence of the Abai Nile with the Didessa. Extracts from the explorer's note-book form a commentary on the map, which is drawn by M. V. Huot on a scale of 1 : 1,000,000.

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*It is essential to correct an error on p. 286 of the BULLETIN. Col. Monteil found at Zau Saghaïr not a fossil bear, but a sea-urchin; a mistake made in reading the French word *ourson* for *oursin*.

† Noticed in the GEOGRAPHICAL RECORD.

A recent mail from Madagascar brings news of a journey performed by M. Guillaume Grandidier in the south of the island, from Fort Dauphin to Tuléar * by Tsiombé, on the Manambovo, to Faux Cap and Cape St. Mary. From Tuléar the young traveller made his way by land to Lake Tsimanampetsotsa, discovered in 1868 by M. Alfred Grandidier, and completed its circuit. Thence he pushed as far to the north as the Mangoka, and he proposes, after making palæontological researches at various points, to return to Fort Dauphin by crossing the southern part of the island by a different route. It may be affirmed that this journey is rich in new information and in important corrections, passing, as the explorer did, through a country imperfectly known, and in some places even totally unknown. He brings back, besides valuable collections of natural history, a map of his route on a scale of 1:200,000. Other contributions to a more exact knowledge of southern Madagascar are found in the monographs brought out by the *Revue de Madagascar*, the periodical which now receives the articles formerly issued in the quarterly *Notes*, *Reconnaissances et Explorations*, now no longer published. A paper to be read is the excellent General Considerations on the Climatology of the Fort Dauphin District by Dr. Decorse, who resides there, and is well acquainted with the region.

Among the most important books published in the last two months must be counted the *Comptes Rendus* of the Eighth Session of the International Geological Congress; the two parts containing not less than 1314 pages of text and 22 separate plates. Most of the articles, naturally, are on geological subjects, such as palæontological stratigraphy, petrography, etc.; but others have interest and value for geographers. Among these memoirs, accompanied by new maps, are the Geological Sketch of the Sinaïtic Peninsula, by Mr. W. F. Hume; maps of the Desert in Eastern Egypt, by Messrs. Barron and Hume; the map of the Principal Depressions or Oases of the Libyan Desert, by Mr. H. J. L. Beadnell; and a Geological Sketch of Madagascar, by M. Marcelin Boule, on a scale of 1:6,000,000. The volumes abound in facts; it is only to be regretted that some communications (that of M. G. B. M. Flamand, on the Geology of Southern Algeria, and that of M. Arctowski, on the Glaciers and the Geology of the Lands discovered by the Belgian Antarctic Expedition) are so briefly summarised, and that the account of the numerous excursions, thirty-five and more, organized in France by the Committee, is made so short. It is true that the remarkable guide-book, published before the Congress under the title of

* The official spelling is *Tulléar*.

Guide Géologique de la France, furnishes for most of the places visited by members of the Congress very precious information, and constitutes a working instrument of the first order for geographers as well as for geologists; none the less, it might have been well to give more extended notices of the discussions which took place on the spot. In this way the report on the excursions would have formed a very useful complement of the guide-book itself.

One of the points visited during the Congress of 1900 was the Quaternary volcano of Gravenoire, with its cone in the form of a cupola covered with pines and beeches, and rising about two miles to the south-west of Clermont-Ferrand, more than 1300 feet above the Limagne. An excellent monograph on this volcano, by M. Glangeaud, appears in the *Bulletin des Services de la Carte Géologique de la France*. M. Glangeaud has proved that the volcano was situated on a fault (the western fault of the Limagne), which brought the Tertiary strata of the Limagne against the crystalline rocks that constitute the base of the chain of the Puys, and that the smaller volcanoes in the neighbourhood of Beaumont were established on parallel faults. Between these volcanoes and those in Iceland, described by von Keilhack and Thoroddsen, M. Glangeaud has noted very interesting points of comparison.

M. Marcel Monnier is not only a tourist who knows how to observe and to describe countries and peoples. His surveys of routes made during his travels in Asia, in the years 1895–1898, possess such merit that the Société de Géographie, with the aid of the Ministry of Public Instruction, has undertaken to publish them, and there has just appeared, under the title of *Itinéraires à travers l'Asie*, an atlas of 28 plates, drawn by M. J. Hansen from M. Monnier's surveys with the compass. Nineteen of these plates, on a a scale of 1 : 150,000, relate to Korea and China; the others, on a scale of 1 : 750,000, show the traveller's route across Mongolia, the Altai, the Kirghiz steppe, Turkistan, Persia, and Asia Minor. A volume of substantial notices, illustrated by excellent photographs, adds to the interest of this fine publication, in which M. Marcel Monnier appears under a different aspect from that familiar to readers of the first two volumes of the *Tour de l'Asie*.

Few books are brought out between the vacation and the New Year, and only one calls for mention in this place: M. Henri Vignaud's work, *La Lettre et La Carte de Toscanelli sur la route des Indes par l'Ouest.* In this the author takes up and develops the theory which he put forward last year at the XIIth Session of the International Congress of Americanists. To him everything wears

a dubious aspect in the supposed correspondence of Toscanelli with Fernam Martins at first, and afterwards with Christopher Columbus. Bartholomew Columbus seems to have been the author of an imposition, by which the Admiral never profited, nor tried to profit; and the real prime mover in the discovery of America would appear to be not the celebrated Florentine astronomer, but a poor seaman who died in obscurity without leaving even a name to posterity. These are M. Vignaud's principal conclusions. His work will soon appear in English, and he announces that he will before long take up, in a work on the Precursors of Bartholomew Diaz and Christopher Columbus, the history of Alonso Sanchez, of Huelva, who was, perhaps, the unknown pilot that instructed Columbus. It must be admitted, in any case, that the thesis is very alluring, and that M. Vignaud's book, which is solidly constructed and fortified with documents, contains rectifications and information which the historians of geography and of Columbus must henceforth take into account.

Mention must be made, in closing, of the last annual Geographical Bibliography published by the *Annales de Géographie.* In this excellent bibliography, which is under the charge of M. Louis Raveneau, the best geographical productions of the preceding year are classified and succinctly analyzed. This tenth issue, covering the year 1900, is particularly interesting, because it registers the most important geographical books and articles called out by the Universal Exposition, and is, therefore, of equal utility with the solid and noteworthy articles of Messrs. de Margerie and Raveneau on Cartography at the Universal Exposition of 1900.

HENRI FROIDEVAUX.

OBITUARY.

Clarence King.

Mr. King died at Phœnix, Arizona, December 24, 1901, in his sixtieth year.

He was born at Newport, Rhode Island, and he received his education at Hartford, Connecticut, and at the Sheffield Scientific School of Yale University, from which he was graduated in 1862.

In 1863 he crossed the plains to California, where he served for several years on the State Geological Survey, under Prof. Whitney. Among the peaks of the Sierra Nevada measured by him was the highest of all, and to this it was he who gave the name of Mount Whitney.

In 1867 he was made Geologist in Charge of the U. S. Geological Exploration of the Fortieth Parallel, a work covering the topography, geology, and natural history of the country lying along that parallel of latitude from the eastern slope of the Rocky Mountains to the western slope of the Sierra Nevada. The reports of this exploration fill seven quarto volumes and two atlases, the first volume, on Systematic Geology, being the work of Mr. King. While engaged upon this publication, Mr. King's attention was drawn to the reported discovery of rich diamond deposits in the West. He visited the spot, and soon detected and exposed a fraudulent scheme of great magnitude.

In 1878, Mr. King suggested the consolidation of the various surveys carried on by the Government; and in 1879 the U. S. Geological Survey was established under his directorship. He resigned the office in 1881.

In recent years he began to show symptoms of the disease which has carried him off, it must be felt, before his time.

Mr. King's life was devoted to scientific pursuits, but his intellectual sympathies were not limited by science. His culture was wide in literature and in art, and his one published book, *Mountaineering in the Sierra Nevada*, has a charm of its own.

Mr. King became a Fellow of this Society in 1877, and was elected in the same year to a seat in the Council.

NOTES FROM THE DIVISION OF HYDROGRAPHY.

U. S. GEOLOGICAL SURVEY.

Alaskan Exploration. — During the past field season the United States Geological Survey has had four parties engaged in exploring Alaska. The first, under Mr. W. J. Peters, assisted by Mr. F. C. Schrader, started from Skagway early in February, and went 1,200 miles with dog team to Bergman, a trading post on the Koyukuk river in central Alaska, near the Arctic Circle, where a cache of canoes and provisions had been made the previous year. The party then penetrated north to the divide of the Yukon, making portages to the headwaters of the Colville river, and descended through an entirely unknown country to the Arctic Ocean. The country from the mountains to the sea was found to be rolling tundra. Owing to the lateness of the season, the party were obliged to skirt the coast to the west in canoes and whale boat in the hope of reaching Cape Nome before the ice set. After working down the coast for 350 miles they were picked up by a collier.

The second party, under Mr. T. G. Gerdine, assisted by Mr. A. J. Collier, penetrated the Seward Peninsula, on which is located Cape Nome, for about 100 miles, and spent the season in completing the exploration, and mapping the western part of the peninsula, north of the Nome mining district, which was surveyed last year.

The third party, under Mr. W. C. Mendenhall, assisted by Mr. D. L. Reaburn, starting from Fort Yukon, surveyed the Yukon river for a distance of about 200 miles down its course, then crossing the divide to Bergman, where use was made of the cache established the year before, penetrated unknown country to the westward, and descended the Kowak river to Kotzebue Sound, an arm of the Arctic Ocean.

The fourth party, under the command of Mr. A. H. Brooks, worked in south-eastern Alaska examining the mineral deposits and exploring the region from Juneau to Skagway. Two months were spent on Prince of Wales Island and the adjacent mainland.

The work of the Geological Survey of the past year practically marks the close of the exploration stage of its activities in Alaska. The districts of which nothing is known are now of less extent than formerly, and henceforth more detailed mapping and examination of the Territory's resources will take the place of the rapid

and often daring reconnaissance trips hitherto necessary. The size and remoteness of the country, the shortness of the field season, the difficulties of travel, and the danger of losing supplies or of being caught by winter, have made the exploration of Alaska comparable to the work of Lewis and Clarke in their early journey across the continent; but in spite of the difficulties, the parties have carried out their work through five seasons without failure or loss of life.

THE U. S. GEOLOGICAL SURVEY has completed the work undertaken in the summer, in co-operation with the Coast and Geodetic Survey, to redetermine the line of the boundary between the United States and Canada, from the crest of the Rocky Mountains to the Pacific Ocean. The line traversed the Rocky Mountains and the Cascade Range and an intermediate hilly country. The trails, once kept open by the Indians, are now greatly obstructed by falling timber, and the surveyors find the easiest routes to be the paths worn by the bears and deer.

IN IDAHO, Prof. Israel C. Russell has discovered an artesian basin over 100 miles in length, with a western limit (not yet determined) in the vicinity of Nampa and Caldwell. The land which can be supplied from this basin lies along the Snake River and in Bruneau Valley.

THE INVESTIGATIONS conducted by Mr. Charles M. Hall, in the valley of the Red River of the North, have revealed two artesian basins underlying a large portion of the upper valley. The more important of the two is the eastern continuation of the Dakota Artesian Basin, with its eastern limit marked by a line running north and south not far from the middle of the Red River Valley, where the water-bearing horizon comes to within 200 feet of the surface. Twenty-five miles to the westward the depth ranges from 400 to 600 feet. The water is found in clear, white sand, and it is much softer than the surface waters.

The second basin lies above the first, at depths ranging from 50 to 150 feet. The water comes from the sand layers at the base of the glacial drift, and is harder than that from the Dakota basin. It supplies hundreds of flowing wells in farms and towns.

A third water horizon lies still nearer the surface.

ACCESSIONS TO THE LIBRARY.

November–December, 1901.

BY PURCHASE.

Allibone, S. Austin.—Poetical Quotations, Chaucer to Tennyson. Philadelphia, J. B. Lippincott & Co., 1876. 8vo.

Allibone, S. Austin.—Prose Quotations, Socrates to Macaulay. Philadelphia, J. B. Lippincott & Co., 1876. 8vo.

Almanach de Gotha, 1902. Gotha, Justus Perthes, 1902. 8vo.

Anderson, John.—Mission to the East Coast of Sumatra. Edinburgh, W. Blackwood, 1826. 8vo.

Beauclerk, C.—Journey to Marocco. London, Poole & Edwards, 1828. 8vo.

Beazley, C. Raymond.—The Dawn of Modern Geography, Part II. (A. D. 900–1260). London, J. Murray, 1901. 8vo.

Browne, G. F.—Ice-Caves of France and Switzerland. London, Longmans, Green & Co., 1865. 8vo.

Burckhardt, J. L.—Notes on the Bedouins and Wahábys. London, H. Colburn & R. Bentley, 1831. 2 vols. 8vo.

Burmeister, H.—Reise nach Brasilien. Berlin, Georg Reimer, 1853. 8vo.

Carmichael, Montgomery.—In Tuscany. New York, E. P. Dutton & Co., 1901. 8vo.

Crawfurd, J.—Descriptive Dictionary of the Indian Islands, and Adjacent Countries. London, Bradbury & Evans, 1856. 8vo.

Cunynghame, Arthur.—An Aide-De-Camp's Recollections of Service in China. London, Saunders & Otley, 1844. 2 vols. 8vo.

Darmesteter, James.—The Mahdi, Past and Present. London, T. Fisher Unwin, 1885. 8vo.

Dictionary of National Biography. Edited by Sidney Lee. Supplement, Vol. 3. London, Smith, Elder & Co., 1901. 8vo.

Drake, S. A.—Nooks and Corners of the New England Coast. New York, Harper & Bros., 1876. 8vo.

Duka, Theodore.—Life and Works of Alexander Csoma de Körös. London, Trübner & Co., 1885. 8vo.

Dwight, H. O.—Constantinople and its Problems. New York, F. H. Revell Co., 1901. 8vo.

Estridge, H. W.—Six Years in Seychelles. s. l., 1885. 4to.

Fitzgerald, E. A.—The Highest Andes. London, Methuen & Co., 1899. 8vo.

Forbes, C. J. F. S.—British Burma and its People. London, J. Murray, 1878. 8vo.

Fountain, Paul.—Great Deserts and Forests of North America. London, Longmans, Green & Co., 1901. 8vo.

Foureau, F.—D'Alger au Congo par le Tchad. Paris, Masson & Cie., 1902. 8vo.

Gorton, John—A General Biographical Dictionary with Supplement. London, H. G. Bohn, 1851. 4 vols. 8vo.

Greswell, William Parr.—Geography of Africa South of the Zambesi. Oxford, Clarendon Press, 1892. 8vo.

Hart, A. B. (*Editor*).—American History told by Contemporaries. New York, Macmillan Co., 1900–1901. 4 vols. 8vo.

Hearn, Lafcadio.—A Japanese Miscellany. Boston, Little, Brown & Co., 1901. 8vo.

Helmolt, H. F. (*Editor*).—Weltgeschichte—3. Band, Westasien und Afrika. Leipzig u. Wien, Bibliographisches Institut, 1901. 8vo.

Horton, George.—Modern Athens. New York, Charles Scribner's Sons, 1901. 8vo.

Hurgronje, C. Snouck.—Mekka. Haag, M. Nijhoff, 1888–89, 2 vols., 8vo., & Bilder-Atlas, folio.

Jeppe, Fred., & Jeppe, C. F. W.—Map of the Transvaal or S. A. Republic, & Surrounding Territories. Pretoria, 1899. London, Edward Stanford (1901), 6 sheets, 37¼ x 25⅝, in case.

Lewin, T. H.—Wild Races of South-Eastern India. London, W. H. Allen & Co., 1870. 8vo.

Lynch, H. F. B.—Armenia, Travels and Studies. London, Longmans, Green & Co., 1901. 2 vols. 8vo.

Mac Guckin de Slane, Baron (*Translator*).—Ibn Khallikan's Biographiçal Dictionary. Paris, Benjamin Duprat, 1843–1871. 4 vols. 4to.

Mahomed Kahn, Sultan (*Editor*).—The Life of Abdur Rahman, Amir of Afghanistan. London, J. Murray, 1900. 8vo.

Martin, W. A. P.—The Lore of Cathay. New York, F. H. Revell Co., 1901. 8vo.

Moore, George F.—Diary of Ten Years' Eventful Life of an Early Settler in Western Australia. London, M. Walbrook, 1884. 8vo.

Muir, John.—Our National Parks. Boston & N. Y., Houghton Mifflin & Co., 1901. 8vo.

New York, Manual of the Corporation of the City of. D. T. Valentine. New York, Casper C. Childs, 1847. 16mo.

Ollone, Capitaine d'.—De la Côte d'Ivoire au Soudan et à la Guinée. Paris, Hachette et Cie., 1901. 8vo.

Pery, G. A.—Geographia e Estatistica Geral de Portugal e Colonias. Lisboa, Imprensa Nacional, 1875. 8vo.

Petrie, W. M. Flinders.—Diospolis Parva: The Cemeteries of Abadiyeh and Hu. London, Egypt Exploration Fund, Special extra volume, 1901. 4to.

Petrie, W. M. Flinders.—The Royal Tombs of the Earliest Dynasties, 1901, Part II. Twenty-first Memoir of the Egypt Exploration Fund. London, 1901. 4to.

St. Clair, T. S.—A Residence in the West Indies and America. London, R. Bentley, 1834. 2 vols. 8vo.

Selous, Percy, and Bryden, H. A.—Travel and Big Game. London, Bellairs & Co., 1897. 8vo.

SIMPSON, WILLIAM.—Private Journal kept during the Niger Expedition, 1841–42. London, J. F. Shaw, 1843. 8vo.

SWAINSON, C.—A Handbook of Weather Folk-Lore. Edinburgh, Blackwood, 1873. 8vo.

THOMAS, E.—Revenue Resources of the Mughal Empire in India. London, Trübner & Co., 1871. 8vo.

THOMAS, J.—Universal Pronouncing Dictionary of Biography and Mythology. Philadelphia, Lippincott & Co., 1871. 2 vols. 8vo.

TORREY, BRADFORD.—Footing it in Franconia. Boston and New York, Houghton, Mifflin & Co., 1901. 8vo.

TRÜBNER, K. (*Editor*).—Minerva: Jahrbuch der Gelehrten Welt, 1901–1902, XI. Jahrgang. Strassburg, K. J. Trübner, 1902. 8vo.

WELBY, M. S.—'Twixt Sirdar and Menelik. New York, Harper & Bros., 1901. 8vo.

Whitaker's Almanack, 1902. London, J. Whitaker, 1902. 8vo.

Zeitschrift für Allgemeine Erdkunde, Neue Folge, 19 Band. Berlin, D. Reimer, 1865. 8vo.

BY GIFT.

From le R. P. José Algué, S. J., Author:

Relation entre quelques Mouvements Microséismiques et l'Existence, la Position et la Distance des Cyclones à Manille (Philippines). Extrait des Procès-Verbaux et Mémoires du Congrès International de Météorologie (Paris, septembre, 1900).

From the Argentine Government:

Argentine-Chilian Boundary: Report to Tribunal, Parts I–IV; Maps, I–XVI. London, W. Clowes & Sons, 1900. 5 vols. 4to.

From Prof. Emile Chaix, Geneva:

Paul Chaix: 1808–1901 (Extrait du GLOBE, Tome LX, *Bulletin*), Genève, 1901, 8vo; Les Travaux de Paul Chaix, avec une Carte inédite et une Planche (Extrait du GLOBE, Tome LX, *Mémoires*), Genève, 1901, 8vo.

From William Emerson:

Sheet Map: France par Départements et par Provinces. Paris, A. Logerot, 1870, 29½ x 22¼.

From G. Marinelli, Author:

L'Accroissement du Delta du Po au XIXe Siècle. Publication No. 6, Université Nouvelle, Institut Géographique de Bruxelles. Bruxelles, 1901. 8vo.

From Chandler Robbins:

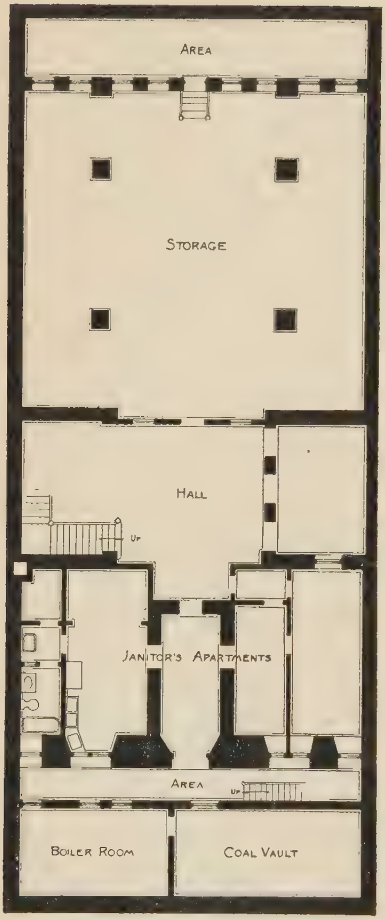
Atlas of maps by N. Visscher, Pieter Goos, and others (no title). s. l., s. a., folio.

From G. Schlegel, Author:

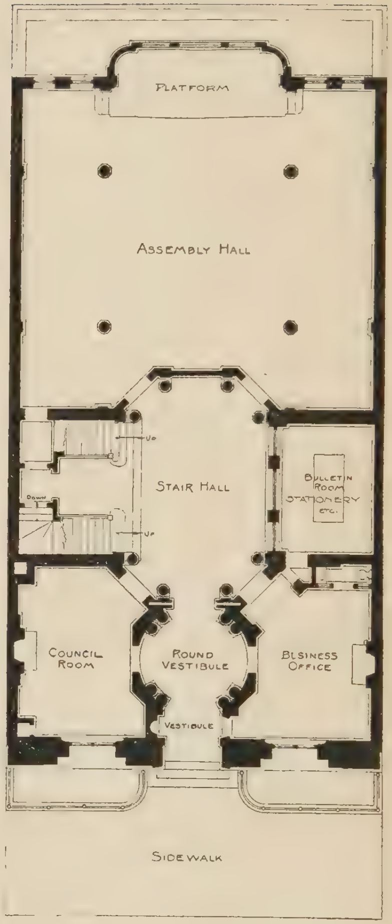
Geographical Notes, XVI. The Old States in the Island of Sumatra. Reprinted from the T'oung Pao, Serie II, Vol. II, 1901.

From La Société pour la Propagation des Langues Étrangères en France:

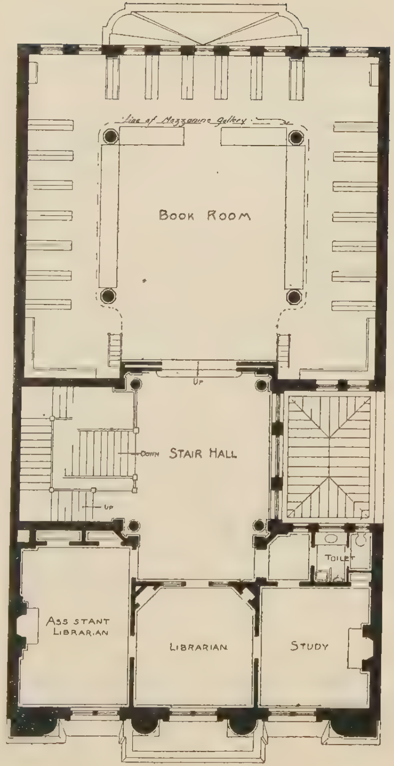
Congrès des Langues Vivantes. Exposition Universelle, 1900: Une Nouvelle Solution de la Question de la Langue Universelle excluant la Création d'une langue artificielle, Paris (1900), 8vo; Notes sur la Langue internationale, par M. Paul Chappellier, Paris (1901), 8vo.



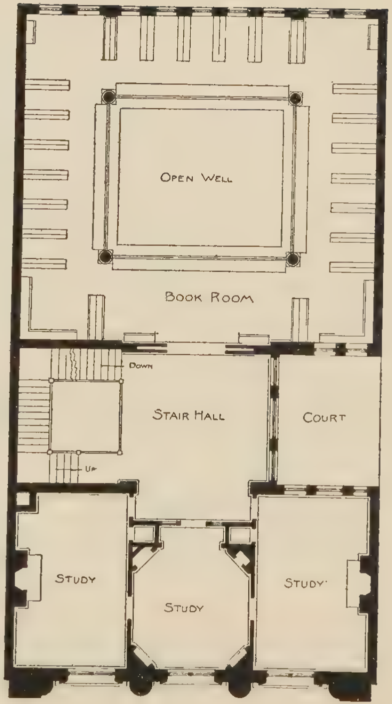
BASEMENT PLAN.



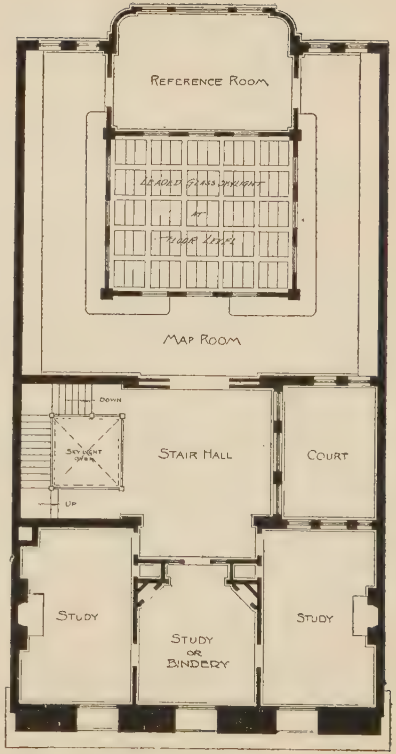
FIRST FLOOR PLAN.



Second Floor Plan.



Third Floor Plan.



Fourth Floor Plan.

NOTES AND NEWS.

THE SOCIETY is now established in its permanent home at No. 15 West Eighty-first Street, and the accompanying plans show the disposition of space on the five floors of the building. Especial care has been taken to provide for ventilation and the admission of light, and it is hoped that the rooms will be found commodious and comfortable in every respect.

The removal of the books and maps and other collections from the Society's former house has been successfully accomplished, and the rearrangement of the Library and Map-room is proceeding with regularity.

THE ANNUAL MEETING of the Society will be held at Mendelssohn Hall, No. 119 West Fortieth Street, on the 21st of January, 1902, at 8.30 o'clock P.M.

After the presentation of reports, the election of Fellows and other business, Mr. Alden Sampson will address the Society on his visit to Palmyra.

On the 18th of February, Prof. Richard E. Dodge will read a paper on Life Conditions in a Desert, with especial reference to the South-Western United States.

On the 18th of March, M. Hugues Le Roux will describe (in French) his visit to the Emperor Menelik.

IT HAS BEEN DECIDED that the yearly bound volume of the BULLETINS, hitherto issued under the title of *The Journal*, shall hereafter bear the name of THE BULLETIN.

This change of title will not affect the numbering, and the volume for 1901 will take its place in the series as the BULLETIN, Vol. XXXIII. The Index to this volume will be issued with the first number for 1902.

THE THIRTEENTH SESSION of the International Congress of Americanists will be held October 20–25, 1902, in the halls of the American Museum of Natural History in this city.

Those interested in the archæology, ethnology, and early history of the two Americas may become Members of the Congress by signifying their desire to Mr. M. H. Saville, General Secretary of the Commission of Organization (at the Museum), and remitting through him, or to the Treasurer direct, the sum of three dollars.

Congratulations and best wishes for continued prosperity are due to the East Siberian Section of the Imperial Russian Geographical Society, which celebrated at Irkutsk, on the 17/30 of November, the fiftieth anniversary of its foundation.

Justus Perthes is now bringing out the ninth edition of Stieler's Hand-Atlas in *lieferungen*, each containing two maps, at intervals of from two to three weeks, at the reduced price of 30 marks (7.50) for the complete atlas of 100 maps.

A full alphabetical index of names will be be for sale, at a moderate price, after the publication of the last *lieferung*.

Prof. Emile Chaix, of Geneva, sends a copy of the *Notice sur les Travaux de Paul Chaix*, contributed to *Le Globe*, Tome LX.

The list of Prof. Paul Chaix's principal publications fills eight pages of the *Notice*, which contains also an account, written by him, of the Vaudois valleys of Piedmont, with a hitherto unpublished map, drawn in 1854. Of this the author says:

> I have inscribed in my map the names of 495 towns, villages, and hamlets, of 15 large valleys, of 140 mountains and passes, of 121 streams and brooks, and I have marked, in columns at the sides, the elevation of 119 points, 87 of which are from my own observations. In spite of this show of figures, I cannot hide from myself the fact that the map is still incomplete; but I thought it better to leave blanks to be filled than too many mistakes to be corrected.

M. Emile Chaix's remarks on his father's life and character win the respect and sympathy of his readers.

M. Paul Chappellier is the author of a communication to the *Congrès des Langues Vivantes* at the Paris Exposition of 1900 on the subject of the Universal Language; or, as he prefers to call it, the International Language. He will have nothing to do with Volapük or Esperanto, or any other artificial tongue. His proposition is that French or German (whichever is chosen) be made obligatory in the schools of the English-speaking nations, and English obligatory in the schools of France and Germany. This would make the people of these nations familiar with two of the most widely-known languages, and the obvious advantage of ready communication with these nations would lead the people of other countries to adopt one, at least, of the chosen tongues, and the International Language would be established. In no short time, of course; M. Chappellier recognises the fact, and admits the difficulties in the way of an international agreement upon such a subject. He cites, however, the instances of the Universal Postal

Union, the Geneva Cross, and the neutrality of sub-marine cables to show that agreement is not impossible; and he foresees the adoption of the metric system by England and the acceptance of the Greenwich meridian by France.

The cases are hardly analogous. Governments agree that a letter shall be carried for five cents, and the thing is done. Study is a different matter. The teacher may be required by law to give instruction in a language; it does not follow that the scholars will learn what is taught.

The International Language may be added to the number of visionary schemes for the improvement of the world.

THE U. S. BOARD ON GEOGRAPHIC NAMES, at a meeting held December 4, 1901, made the following decisions:

BOWLEMS; creek and mountain, Yancey Co., N. C.
(Not Bolens.)

CASCADE SPRINGS; post village, Fall River Co., S. Dak.
(Not Cascade.)

CHIKASANOXEE; creek, tributary to Tallapoosa river, Chambers Co., Ala.
(Not Chickasonoxie, etc.)

COHOBADIAH; creek, tributary to the Little Tallapoosa, Cleburne and Randolph counties, Ala.
(Not Cohabadia nor Hobadijah.)

CUTNOSE; creek, tributary to the Little Tallapoosa, Randolph Co., Ala.
(Not Cutnoe nor Cut Nose.)

GILLESPIE; creek, Ohio Co., W. Va.
(Not Gillaspies, Glasby nor Glyspie.)

LA PURISIMA CONCEPCION; land grant, Santa Clara Co., Cal.
(Not La Purissima Concepcion.)

NEW WINDSOR; village, P.O. and R.R. station, Weld Co., Col.
(Not Windsor.)

PALOMAR; mountain, in northern part of San Diego Co., Cal.
(Not Smith.)

PIT; river, tributary to the Sacramento river in northern California.
(Not Pitt.)

NOTE: This name, applied as early as 1850, is thus explained in Pacific Railroad Report, Vol. VI, p. 64:

"We passed many pits about six feet deep, and lightly covered with twigs and grass. The river derives its name from these pits, which are dug by the Indians to entrap game. On this account Lt. Williamson always spelled the name with a single t."

PLUM; creek, tributary to Cheyenne river, Fall River Co., S. Dak.
(Not Plumb.)

ROBINS; creek and marsh, Chincoteague bay, Worcester Co., Md.
(Not Robbins, Robin's nor Robin.)

NOTE: This is a reversal of the decision Robin made in May, 1901.

ROBINS; point, the end of Gunpowder neck, Harford Co., Md.
(Not Robbins nor Robin.)

STANSBURY; creek, branch of Middle river, Baltimore Co., Md.
(Not Stansberry.)

STANSBURY; point, Back river, Baltimore Co., Md.
(Not Stansberry.)

VAILSGATE; P.O. and R.R. station, Orange Co.; N. Y.
(Not Vailgate nor Vail's Tollgate).

WELSH; P.O. and R.R. station, Chambers Co., Ala.
(Not Welch).

TRANSACTIONS OF THE SOCIETY.

NOVEMBER–DECEMBER, 1901.

A Regular Meeting of the Society was held at Mendelssohn Hall, No. 119 West Fortieth Street, on Tuesday, November 19, 1901, at 8.30 o'clock P.M.

Vice-President Tiffany in the chair.

The following persons, recommended by the Council, were elected Fellows:

J. Herbert Senter.	Dr. Martha Krug Genthe.
Alfred H. Smith.	Rev. William E. Todd.
Henry L. Reynolds.	Mrs. Theodorus Bailey Myers.
Howard Willets.	Mrs. Julian-James.
Frederick Van Beuren, Jr.	Charles Stuart Douglas.
Rev. Dr. Charles Cuthbert Hall.	Ormond G. Smith.
Prof. Edward Luther Stevenson, Ph.D.	Charles E. Orvis.
	James H. Falconer.
James H. Hyde.	George Watson Cole.
Emil V. Kohnstamm.	Clinton Gilbert.
Andrew J. C. Foyé.	Albert Symongton.

Walter Phillips Terry.

The Chairman announced the resignation of the President, laid before the Council on the 14th of November and accepted, in the following correspondence:

GREAT BARRINGTON, MASS., Nov. 8, 1901.

MY DEAR MR. PARISH:

My election to the Mayoralty compels me to concentrate all my attention upon that one duty. I am obliged, therefore, to hand you, herewith, my resignation as President of the Am. Geographical Society, and to ask for its acceptance at an early day.

Regretting to terminate so soon an association that has been so congenial, I am,

Yours sincerely,

(Signed) SETH LOW.

MR. HENRY PARISH,
Chairman Ex. Committee.

THE AMERICAN GEOGRAPHICAL SOCIETY, NEW YORK:

NOVEMBER 15, 1901.

HON. SETH LOW:

DEAR SIR,—

At a meeting of the Council of the American Geographical Society, held Nov. 14th, 1901, your resignation as President of the Society was pre-

sented, and under the circumstances there seemed no alternative but to accept the same, which the Council did, very reluctantly.

Duly appreciating the importance of the high position to which you have been called by the people, it is a source of satisfaction that your connection with this Society is severed only that you may assume an office in which you can render most important service to the community at large.

We beg to tender to you our high regard and esteem and to assure you of our deep interest in the success of your administration as Mayor of this city.

Very truly yours,

(Signed) A. A. RAVEN,
Sec'y pro tem.

The Chairman then introduced the speaker of the evening, Mr. Herbert L. Bridgman, who delivered a lecture on Peary's Progress to the Pole. Among the illustrations thrown upon the screen was Peary's detailed map of the northern coast of Greenland.

On motion, the Society adjourned.

A Regular Meeting of the Society was held at Mendelssohn Hall, No. 119 West 40th Street, on Tuesday, December 17, 1901, at 8.30 o'clock P.M.

Vice-President Moore in the chair.

The following persons, recommended by the Council, were elected Fellows:

John Flack Winslow.	Charles Hoffman, Jr.
Miss Matilda W. Bruce.	William Bruce-Brown.

The Chairman then introduced to the Society Capt. J. Slocum, who delivered a lecture entitled Sailing Alone Around the World.

On motion, the Society adjourned.

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